# MedWeld 3005

## PLC/Weld Control Logic

*Integrator's Guide*

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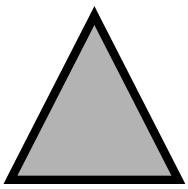

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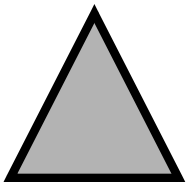

# Getting Started

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|---|---|---|---|---|
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| 4,001,540 | 4,289,951 | 4,459,457 | 4,831,229 | 5,386,096 |
| 4,104,724 | 4,301,351 | 4,463,244 | 4,849,873 | 5,424,506 |
| 4,251,764 | 4,388,515 | 4,513,363 | 4,851,635 | 5,449,877 |
| 4,254,466 | 4,399,511 | 4,516,008 | 4,885,451 | 5,589,088 |
| 4,282,417 | 4,456,809 | 4,733,045 | 4,945,201 | 5,757,176 |
| | | | | 5,793,243 |

Additional patents are pending.

# Acknowledgments

MedLAN is the proprietary local area network used to interconnect products manufactured by WTC.

The following companies own the marks following their names:

- Allen-Bradley, SLC
- Microsoft Windows™.

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| | | |
|---|---|---|
| **ITS** | (877) 982-7378 | Fax: (248) 477-5263 |
| **WTC Canada** | (905) 433-1230 | Fax: (905) 433-1257 |

The ITS telephone number offers 24-hour service, seven days a week. Before calling, make a note of any fault conditions, applicable software and hardware revision numbers. View these numbers on the HHT by pressing STATUS MODE, then F5. Then press F1 for the revision status; or F2 for the hardware status.

Record the part number of the enclosure (on the serial tag on the inside or front door of the enclosure). Also note the sequence of events leading to the problem, and the drawing numbers of the schematics you received with the enclosure.

### By Email:

When an immediate response is not critical, you can contact WTC at the following email addresses:

| | |
|---|---|
| **welding-sales@weldtechcorp.com** | Sales/Marketing Comments |
| **welding-support@its-wtc.com** | Technical Support |

WTC's technical support will respond within 24 hours, Monday through Friday, to your e-mail requests. Please include your name, company name, location, product part and serial number and a description of the problem with your request. Be sure to indicate how you want us to respond, and include applicable phone and fax numbers with your e-mail address.

### On the Web:

You can also visit our Web site at:

**www.weldtechcorp.com**

### By Mail:

Or, contact us by mail at the following addresses:

**WTC**
24775 Crestview Court
Farmington Hills, MI 48335

**WTC Canada**
240 Cordova Road
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# Symbols Used in This Manual

In compliance with CE standard, the following symbols are used to identify safety instructions. Their meaning is as follows:

**Danger!**

*This symbol will be used wherever the failure to observe safety measures may result in death, severe bodily injury, or considerable damage to property.*

**Warning!**

*This symbol will be used wherever insufficient or lacking compliance with instructions may result in personal injury.*

**Caution!**

*This symbol will be used when insufficient or lacking compliance with the instructions may result in damage to equipment or files.*

**Note:**

*This will be used to inform the user about special features or where to find more information.*

# Revision History

| Software Release | Comments |
|---|---|
| K5200 | Manual major revision: 1997 |
| | Format changes and default listings enhanced |
| | Manual revision: June, 2001 |

# Safety Warnings

*To the Integrator...*

**Warning!**

*Certain applications of this control may require the addition of one or more safety circuits. Please review the safety features before connection and take any steps required to protect the weld operator.*

*To the Operator...*

**Danger!**

*Lethal voltages are present when power is applied to the control. Service to this machine should be attempted only by qualified maintenance personnel.*

# How to Use This Manual

This manual is meant to help you work through the integration of the tool ladder logic with WTC's overhead ladder logic. (This is provided with the MedWeld 3005 Software Integrator's Tool Kit.) It is also designed to further your knowledge of the MedWeld 3005's weld processor capabilities.

- Chapter 1 discusses how to design an SLC welding system from the card rack up. This includes hints on card rack layout and power requirements.
- Chapter 2 describes operation of all the available memory locations.
- Chapter 3 details the purpose of each ladder file in the WTC overhead ladder logic.
- Chapter 4 lists a recommended procedure for integrating the tool and overhead logic, and explains how to use the messaging option.

# Tool Kit Contents

This manual is provided as part of the WTC MedWeld 3005 Integrator's Tool Kit. It consists of the following:

- *MedWeld 3005 Integrated Weld Control* Technical Reference Manual.
- *MedWeld DEP-100S* Operator's Guide
- *MedWeld 3005 PLC/Welding Control Logic Interface* Integrator's Guide
- Allen-Bradley *Industrial Automation Wiring and Grounding Guidelines* Manual
- Diskette containing the WTC ladder logic programs:

| WCUs | Non-Messaging | Messaging |
|---|---|---|
| 1 | VA_EXAM | VB_EXAM |
| 1 | VA1_EXAM | VB1_EXAM |
| 3 | VA3_EXAM | VB3_EXAM |
| 6 | VA6_EXAM | VB6_EXAM |
| 9 | VA9_EXAM | VB9_EXAM |
| 12 | VAC_EXAM | |
| 9 | VA1R05 | VB1R07 |

  - VA9_EXAM — Standard SLC ladder program, which works with MedWeld 3005 software T93300 (for operation of up to 9 weld processors).
  - VA_EXAM — Example version of the standard ladder program (for single weld processor operation).
  - VB1R07 — Provides support for external programming and weld data acquisition. This version requires software version T93301-00-02 (or higher). (For 9-weld-processor operation.)
  - VB_EXAM— Example version providing support for external programming and weld

data acquisition. (For single weld processor operation.)

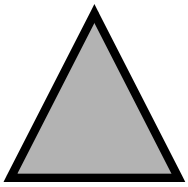
Refer to “Hardware Design” on page 1-2 for processor limitations.

**Note:**

*The ladder logic files provided with the Software Integrator’s kit only have examples of the overhead logic required to interface the WTC weld processor card(s) with the customer’s logic. If you have problems understanding either the ladder program or the intent of the logic, WTC can provide assistance either by telephone or written fax.*

*WTC’s ladder diagram program must be modified to configure the system, and to define and control the inputs and outputs. The WTC logic is designed to serve as only a portion of the logic necessary to control the overall system.*

**WTC IS NOT RESPONSIBLE FOR THE IMPLEMENTATION, FUNCTIONALITY, TRAINING OR SUPPORT OF THE FINAL LOGIC PROGRAM.** *The system integrator/logic designer is responsible for support of the system logic.*



# System Configuration 1

The MedWeld 3005 weld control represents a new phase in resistance welding technology. It integrates a welding control processor board with card rack-based design in an Allen-Bradley SLC 500 programmable controller. The welding and machine controls are housed in a single enclosure.

The weld processor board interfaces to the weld firing card through a wiring harness plugged directly into the front of the weld processor card.

The MedWeld 3005 also offers multiple programming options. The control can be programmed *via* WTC programming devices or through the ***MedLAN*** local area network. WTC's Welding Support System (WSS) and Weld Information Center (WIC) both provide programming and data acquisition for a network of welding controls from a central location.

With the introduction of the MedWeld 3005 with external data-acquisition support, the system lets you to upload or download information to or from the weld processor *via* the ladder program. This allows the Allen-Bradley products to serve as the welding interface. This includes products such as ***PanelView*** or other SLC interface programming device.

System requirements will vary, depending on the MedWeld 3005 software version selected.

**Note:**

*The Integrator's Tool Kit provides two types of WTC-supplied ladder diagram program: the VA series (the standard interface), and the VB series (which supports extended data-acquisition features). Both ladder program types are supplied on the software diskette. However, the extended support features will* NOT *function properly unless the weld control processor is running a current weld control program. Consult your WTC sales or service representative for more details.*

This manual provides guidelines for the design of hardware, documents the SLC memory file organization, the program file organization of the WTC-supplied ladder program, and the unique memory requirements of the enhanced support options.

Other sections describe the steps needed to customize the WTC ladder logic to suit your application requirements. In addition, recommendations and hints for the user's ladder logic program.

# Hardware Design

## Cabinet Layout Requirements

Refer to the Allen-Bradley ***Industrial Automation Wiring and Grounding Guidelines Manual*** for information on

- Grounding requirements
- Spacing between racks.

## Chassis Layout Requirements

When laying out an A-B SLC system chassis, consider these major guidelines:

### Guideline 1

Locate the MedWeld 3005 weld processor card(s) in the slot(s) nearest the power supply, but AFTER the SLC's CPU. However, if using an extension chassis, place the WTC weld processor as the FIRST card in the extension chassis.

### Guideline 2

DO NOT place the WTC 3005 weld processor and the cabinet safety I/O in any remote chassis.

---

**Note:**

*A remote chassis is defined as a chassis that is not directly controlled by a SLC CPU. An example might include using an A-B 1747-ASB module in the chassis containing the WTC weld processor.*

*However, if a RIO connection is needed, a local processor and a 1747-DCM (or WTC RIO module) can be used.*

### Guideline 3

If the application requires more WTC processor cards than a single power supply can support, an extension chassis can be used.

**Note:**

*A-B limits the number of extension chassis for the SLC to two. The SLC's CPU can directly control up to 6 weld processor cards per chassis.*

## Power Requirements

Refer to the following information on power requirements to help you properly size the SLC power supply to the SLC system chassis.

### WTC Weld Processor (p/n 900-6663-5MO):

+ 5 VDC @ 320 mA.
+ 24 VDC @ 89 mA.

### Data Entry Panel (DEP-100S) Requirements:

+ 5 VDC @ < 10 mA.
+ 24 VDC @ 85 mA.

### Network Port Requirements:

+ 5 VDC @ < 25 mA.
+ 24 VDC @ < 10 mA.

## Minimum Memory Requirements

WITHOUT data messaging between the SLC and WTC weld processors:

| Processors | Memory Requirements |
|---|---|
| 1 | 1 kB |
| 2 or more | 1/2 kB for each additional processor |

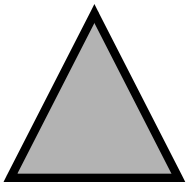
WITH data messaging between the SLC and WTC weld processors:

| Processors | Memory Requirements |
|---|---|
| 1 | 4 kB |
| 2 or more | 1 kB for each additional processor |

These guidelines include the overhead logic being optimized for the number of weld processors used in your application and a simple logic program. As the tool logic increases, the memory requirements will also need to be adjusted for the increase.

## Processor Requirements

Data messaging between the SLC and the WTC weld processors requires an Allen-Bradley 5/03 processor or greater.



# SLC Memory File Organization 2

## Operational Overview

The MedWeld 3005 weld control sits in the Allen-Bradley SLC 500 chassis. This allows the weld processor card to directly communicate with the SLC 500 series of controls.

The information passed between the weld processor and SLC CPU is accessed directly by the SLC through its input and output image files. This information is then organized by the base SLC ladder logic (provided by WTC along with the design package) into files #50 through #100. These files reside in the SLC's CPU memory map.

This ladder logic also provides error checking off the WTC weld processor operation and control of the safety I/O signals.

## Configuration Information

When configuring the A-B SLC 500 chassis, any slot containing a WTC weld processor card will be defined as having a configuration code of **3535**. This code is defined as any card in the SLC chassis that provides 8 words of input and 8 words of output from the SLC CPU.

When configuring the A-B SLC 500 chassis, any slot that contains a WTC RIO network module will be defined as having one of the following configuration codes:

| # of Words | Size of Rack | Configuration Code |
|---|---|---|
| 2 words | 1/4 rack | **3235** |
| 4 words | 1/2 rack | **3335** |
| 6 words | 3/4 rack | **3435** |
| 8 words | Full rack | **3535** |

# Data File Memory Map Organization

The ladder logic supplied by WTC will use data files 50 – 100. The currently-defined files include:

| File | Description |
|---|---|
| B50 | Provides user control over the WTC-supplied ladder logic. |
| B51 | Controls the WTC weld processor card. |
| B52 | Provides status on the operation of the system. |
| B53 | Houses the required safety I/O bits, and analog support. These bits are mapped to the I/O card(s) containing the safety I/O signals. |
| B54 | Binary Select monitor. |
| B55 | General bits to the WTC-supplied ladder logic. |
| B61 | Contains the 8 words of welding I/O for the first weld control unit (WCU). |
| B62 | Contains the 8 words of welding I/O for WCU #2. |
| B63 | Contains the 8 words of welding I/O for WCU #3. |
| B64 | Contains the 8 words of welding I/O for WCU #4. |
| B65 | Contains the 8 words of welding I/O for WCU #5. |
| B66 | Contains the 8 words of welding I/O for WCU #6. |

| File | Description |
|---|---|
| B67 | Contains the 8 words of welding I/O for WCU #7. |
| B68 | Contains the 8 words of welding I/O for WCU #8. |
| B69 | Contains the 8 words of welding I/O for WCU #9. |
| B70 | Contains the 8 words of welding I/O for WCU #10. |
| B71 | Contains the 8 words of welding I/O for WCU #11. |
| B72 | Contains the 8 words of welding I/O for WCU #12. |
| T76 | Used to evaluate the pulsed I/O heart beat that every WTC weld processor provides to indicate it is operating normally. |
| T77 | Used to evaluate the proper operation of the system. |
| T78 | Used by the WTC ladder logic for general-purpose timers. |
| C80 | Used by the WTC ladder logic for general-purpose counters. |
| N90 | Contains the messaging option data. |
| N91 | Contains the weld data for data acquisition. |
| N93 | Contains the weld sequence data for data acquisition. |
| N94 | Contains the stepper profile for data acquisition. |
| N95 | Contains the stepper data for data acquisition. |
| B96 | Contains the fault bit mask. |
| N98 | Part ID Transfer. |

## Data File B50 User Control Options

### B50:0 USER OPTIONS

This word defines the active weld processor to the system.

| Bit | User Options |
|---|---|
| 00 | Spare |
| 01 | Weld Processor #1 Available |
| 02 | Weld Processor #2 Available |
| 03 | Weld Processor #3 Available |
| 04 | Weld Processor #4 Available |
| 05 | Weld Processor #5 Available |
| 06 | Weld Processor #6 Available |
| 07 | Weld Processor #7 Available |
| 08 | Weld Processor #8 Available |
| 09 | Weld Processor #9 Available |
| 10 | Weld Processor #10 Available |
| 11 | Weld Processor #11 Available |
| 12 | Weld Processor #12 Available |
| 13 | Spare |
| 14 | Spare |
| 15 | Spare |

**B50:0/0** Spare.

**B50:0/1-12** Indicates that the weld processor is available.

If setting this signal low in program File 52, the ladder logic will not check the I/O Heart Beat of the designated weld processor, nor will it check for proper operation of the processor with respect to the inputs it receives.

**B50:0/13-15** Spare.

## B50:1 SLC 500 I/O VERSION & REVISION NOs.

This word contains the information (to be displayed on the MedLAN programming network) that identifies the ladder logic version and revision level being used by the customer.

| Bit | SLC 500 I/O Version Number |
|---|---|
| 00 | Version Bit 1 |
| 01 | Version Bit 2 |
| 02 | Version Bit 3 |
| 03 | Version Bit 4 |
| 04 | Version Bit 5 |
| 05 | Version Bit 6 |
| 06 | Version Bit 7 |
| 07 | Version Bit 8 |
| 08 | Revision Bit 1 |
| 09 | Revision Bit 2 |
| 10 | Revision Bit 3 |
| 11 | Revision Bit 4 |
| 12 | Revision Bit 5 |
| 13 | Revision Bit 6 |
| 14 | Revision Bit 7 |
| 15 | Revision Bit 8 |

**B50:1/0-7** An 8-bit binary number indicating the version of the ladder. (For example: logic. xxxxxxxxxx11000101 SLC = C5.nn.)

**B50:1/8-15** An 8-bit binary number indicating the revision of the ladder. (For example: logic. 100000101xxxxxxxxxx SLC = nn.82.)

| Binary | Decimal | MedLAN |
|---|---|---|
| 100000101100101 | 33477 | SLC = C5.82 |

The version number should begin with an (A, B, C, D, E or F) to distinguish the customer-supplied ladder logic from the ladder program provided entirely by WTC.

## Extended WCU Messaging Features

### B50:2 WCU MESSAGING REQUEST

This word is used to request that data be uploaded to (or downloaded from) the weld control specified by N90:1.

| Bit | WCU Message Request |
|---|---|
| 00 | Abort data transfer |
| 01 | Upload stepper profile (Linear stepper only) |
| 02 | Download stepper profile (Linear stepper only) |
| 03 | Upload weld sequence |
| 04 | Download weld sequence |
| 05 | Request weld data |
| 06 | Upload fault data |
| 07 | Upload stepper data |
| 08 | Download stepper data (*Not currently supported*) |
| 09 | Request MedLAN address (Upload) |
| 10 | Set MedLAN address (Download) |
| 11 | Download Part ID (T96305-07) |
| 12 | Reserved |
| 13 | Reserved |
| 14 | Reserved |
| 15 | Reserved |

**Note:**

*Reserved for VB series programs. (Used for extended functionality messaging. All current T933xx programs support messaging.)*

*For further information on how to use these commands for WCU messaging, refer to Chapter 5,* **Advanced Messaging Options**.

## B50:3 WCU UPLOAD DATA

This word is used to upload weld data from a WCU.

| Bit | WCU Upload Weld Data |
|---|---|
| 00 | Spare |
| 01 | Upload WCU #1 at last weld data |
| 02 | Upload WCU #2 at last weld data |
| 03 | Upload WCU #3 at last weld data |
| 04 | Upload WCU #4 at last weld data |
| 05 | Upload WCU #5 at last weld data |
| 06 | Upload WCU #6 at last weld data |
| 07 | Upload WCU #7 at last weld data |
| 08 | Upload WCU #8 at last weld data |
| 09 | Upload WCU #9 at last weld data |
| 10 | Spare |
| 11 | Spare |
| 12 | Spare |
| 13 | Spare |
| 14 | Spare |
| 15 | Spare |

**Note:**

*Reserved for VB series programs. (Used for extended functionality messaging, with weld controls running current T933xx programs.*

*For more information on using these commands for WCU messaging, see Chapter 5,* **Advanced Messaging Options**.*)*

## B50:4 WCU MESSAGING IN PROCESS

This word is used to upload weld data from a WCU.

| Bit | WCU Messaging in Process |
|---|---|
| 00 | Error in command handling |
| 01 | Upload stepper profile in process |
| 02 | Download stepper profile in process |
| 03 | Upload weld sequence in process |
| 04 | Download weld sequence in process |
| 05 | Spare |
| 06 | Upload fault data in process |
| 07 | Upload stepper data in process |
| 08 | Download stepper data in process |
| 09 | Spare |
| 10 | Spare |
| 11 | Spare |
| 12 | Spare |
| 13 | Spare |
| 14 | Spare |
| 15 | Spare |

**Note:**

*Reserved for VB series programs. (Used for extended functionality messaging, with weld controls running current T933xx programs.*

*For more information on using these commands for WCU messaging, see Chapter 5,* **Advanced Messaging Options***.)*

## Data File B51 Weld Processor Control Options

### B51:0 CONTROL WORD

| Bit | Control Word | |
|---|---|---|
| 00 | Inputs Valid | |
| 01 | Ground Fault Test Passed | |
| 02 | I/O Active (Heart Beat #2 Output) | |
| 03 | Ground Fault | |
| 04 | Welder Spec. Bit #1 | Sets I/O labels for HHT to use: 0 = DNet/RIO standard 1 = 555 standard 2 = DIO 1 3 = DIO 2 |
| 05 | Welder Spec. Bit #2 | |
| 06 | Welder Spec. Bit #4 | |
| 07 | Spare | |
| 08 | Enable Parity Input | |
| 09 | Isolation Contactor Available | |
| 10 | Message Input Data Start | Used For Messaging |
| 11 | Message Input Data End | |
| 12 | Message Input Data Valid | |
| 13 | Message Output Data Acknowledge | |
| 14 | Messaging Enabled | |
| 15 | ISO Cntr Error – BRKR Tripped | |

**B51:0/0** Inputs to the weld processor are valid.

If this signal is low, all inputs from the SLC CPU are considered invalid and the control will ignore all new inputs. If this occurs while any weld control is executing a weld sequence, the weld processor will produce a Weld Interruption fault and abort the weld sequence.

This bit is controlled by the WTC overhead ladder logic; but it can be used to disable the WTC weld processor's I/O.

**B51:0/1, 3** If = **0**, denotes Inputs Valid;
If = **1**, denotes Ground Fault test passed;
If = **3**, denotes a ground fault detected by the ladder.

**B51:0/2** This bit is used along with Bits B6x:0/2 to determine proper operation of the WTC weld processing card. The weld processor will set Bit B6x: 0/2 to the same state as 51: 0/2.

If this transition does not occur within 10 scans of the ladder logic (or 800 msec, whichever is greater), a Heart Beat fault may be generated.

**B51:0/4-7** Reserved for welder specification. (For the RIO / DNet standard, all bits should remain ***unlatched***.)

**Note:**

*For a detailed explanation, consult your WTC sales or service representative.*

**B51:0/8** This bit enables or disables the Odd Parity rule:

The sequence initiated is selected by a combination of active Binary Select bits. Each bit has a weighted value. By adding the weighted values of the active bits, you select the sequence to initiate.

When this bit is high, the control will only recognize an ODD number of active bits. If the sequence to be initiated requires an EVEN number of active bits, the parity bit must also be active, to provide the required odd number of active bits.

If this bit is low, the Odd Parity rule is disabled. This bit is set in ladder File #52, as described on page 4-9.

**B51:0/9** The control contains an isolation contactor that is controlled by the weld processor. This bit tells the control to check for proper function of the isolation contactor.

If this signal is low, the weld processor will not turn on the Isolation Contactor output, nor will it check for proper operation of the contactor. This bit is set in ladder File #52, as described on page 4-9.

**B51:0/10-14** These bits are used for messaging.

**B51:0/15** This bit is set when the isolation contactor is pulled in, and none of the active weld processors are requesting the closure. The SLC will issue a Shunt Trip signal to the breaker and the weld processor will generate an Isolation Contactor Error fault on the MedLAN network. This bit is high ONLY when the condition is identified.

This bit is controlled by the WTC-provided overhead ladder logic.

## B51:1 WCU EVALUATION WORD

| Bit | WCU Evaluation Word |
|---|---|
| 00 | All Heart Beats Correct (Use for I/O Active Output) |
| 01 | Spare |
| 02 | Spare |
| 03 | Spare |
| 04 | Remote communication power-up |
| 05 | Spare |
| 06 | Spare |
| 07 | Spare |
| 08 | Spare |
| 09 | Spare |
| 10 | Spare |
| 11 | Spare |
| 12 | Spare |
| 13 | Spare |
| 14 | Spare |
| 15 | Spare |

**B51:1/0** This bit tells the ladder logic that all WCUs monitored by the overhead logic are responding correctly to the Heart Beat signal and are thus operational. This can also control the I/O active output that is part of the RIO/DNet standard interface.

**B51:1/1-3** Spare.

**B51:1/4** This bit tells the overhead logic to wait for RIO or Dnet communications to be established before checking for Initiate On Power Up errors. This bit is turned on or off in program file 52 on the First Pass of ladder logic.

**B51:1/5-15** Spare.

## Data File B52
## System Status

**CAUTION**

*For an Allen-Bradley SLC-500 processor (5/03 or greater), Data File B52 has been defined as static. This allows the information to be retained if power is cycled. However, if no internal errors were found during the last power-up period, the first-pass sub-routine (Program File #52) will clear Data File B52.*

### B52:0 HOST PLC STATUS

This word contains the host PLC status information that is available by using either a WTC RIO or the A-B DCM module.

| Bit | Host PLC Status |
|---|---|
| 00 | Unused (was Analog Input Channel Select #1) |
| 01 | Unused (was Analog Input Channel Select #2) |
| 02 | Unused (was Analog Output Type Select Bit #1) |
| 03 | Unused (was Analog Output Type Select Bit #2) |
| 04 | Unused (was Analog Output Type Select Bit #4) |
| 05 | Unused (was Analog Input Type Select Bit #1) |
| 06 | Unused (was Analog Input Type Select Bit #2) |
| 07 | Unused (was Analog Input Type Select Bit #4) |
| 08 | Logical OR of the following Fault Bits |
| 09 | Program/Test/Fault Mode Bit |
| 10 | Spare |
| 11 | RIO (DCM) Initialization Bit |
| 12 | Initiation On Power Up Bit |
| 13 | Communications Error Bit |
| 14 | Spare |
| 15 | Spare |

**B52:0/0-7** Unused.

**B52:0/8** Logical OR of the following Fault Bits.

**B52:0/9** The host PLC is not in RUN mode.

**B52:0/10** Spare.

**B52:0/11** The RIO module has been initialized, but has not been scanned by the host PLC.

**B52:0/12** The overhead logic turns this bit on to indicate that when the control powered up, at least one binary select was on, and that the Initiate Weld input was on. This situation is ***Initiation On Power-up***. The WCU will generate an Initiation On Power-up fault.

**B52:0/13** A communications problem exists between the RIO module and the host PLC.

## B52:1 HEART BEAT ERROR WORD

This word identifies if a weld processor is not toggling its I/O bits.

| Bit | Heart Beat Error Word |
|---|---|
| 00 | Spare |
| 01 | Weld Processor #1 Heart Beat Error |
| 02 | Weld Processor #2 Heart Beat Error |
| 03 | Weld Processor #3 Heart Beat Error |
| 04 | Weld Processor #4 Heart Beat Error |
| 05 | Weld Processor #5 Heart Beat Error |
| 06 | Weld Processor #6 Heart Beat Error |
| 07 | Weld Processor #7 Heart Beat Error |
| 08 | Weld Processor #8 Heart Beat Error |
| 09 | Weld Processor #9 Heart Beat Error |
| 10 | Weld Processor #10 Heart Beat Error |
| 11 | Weld Processor #11 Heart Beat Error |
| 12 | Weld Processor #12 Heart Beat Error |
| 13 | Spare |
| 14 | Spare |
| 15 | Spare |

**B52:1/0** Spare.

**B52:1/1-12** The weld processor's MedLAN address is being downloaded serially through the use of the DEP-100S "one-to-one" port; or the firmware is being reprogrammed serially through either the MedLAN port or DEP-100S "one-to-one" port.

**B51:2//13-15** Spare.

## B52:2 REPROGRAMMING EEPROM WORD

This word identifies if a weld processor is reprogramming its EEPROM. This is a Major event, and does not include any programming of sequences, steppers or set-up parameters

| Bit | Reprogramming EEPROM Word |
|---|---|
| 00 | Spare |
| 01 | Weld Processor #1 Reprogramming EEPROM |
| 02 | Weld Processor #2 Reprogramming EEPROM |
| 03 | Weld Processor #3 Reprogramming EEPROM |
| 04 | Weld Processor #4 Reprogramming EEPROM |
| 05 | Weld Processor #5 Reprogramming EEPROM |
| 06 | Weld Processor #6 Reprogramming EEPROM |
| 07 | Weld Processor #7 Reprogramming EEPROM |
| 08 | Weld Processor #8 Reprogramming EEPROM |
| 09 | Weld Processor #9 Reprogramming EEPROM |
| 10 | Weld Processor #10 Reprogramming EEPROM |
| 11 | Weld Processor #11 Reprogramming EEPROM |
| 12 | Weld Processor #12 Reprogramming EEPROM |
| 13 | Spare |
| 14 | Spare |
| 15 | Spare |

**B52:2/0** Spare.

**B52:2/1-12** The weld processor's MedLAN address is being downloaded serially through the use of the DEP-100S "one-to-one" port; or the firmware is being reprogrammed serially through either the MedLAN port or DEP-100S "one-to-one" port.

**B52:2/13-15** Spare.

## B52:3 WELD PROCESSOR I/O ERRORS

These bits indicate the weld processor's incorrect treatment of an input it has received.

| Bit | Weld Processor I/O Error |
|---|---|
| 00 | Isolation Contactor Error |
| 01 | Control Stop Error |
| 02 | No Weld Error |
| 03 | Stepper Reset Error |
| 04 | Control Not Responding |
| 05 | Control Has Reprogrammed EEPROM |
| 06 | Spare |
| 07 | Spare |
| 08 | Initiation at Power-up |
| 09 | Ladder Has Shunt-tripped Breaker |
| 10 | Spare |
| 11 | Spare |
| 12 | Spare |
| 13 | Spare |
| 14 | Spare |
| 15 | Internal Ladder Identified Error |

**B52:3/0** Isolation Contactor Error is defined as follows:

The isolation contactor's main contacts are still closed (as seen by the Safety I/O input I. C. status) while none of the weld processor units are requesting that these contacts be closed.

This bit will remain high after the condition is cleared until power to the unit is cycled for debugging and troubleshooting.

**B52:3/1** Control Stop error is defined as follows:

The isolation contactor's main contacts are still closed (as seen by the Safety I/O input I. C. status) while the Control Stop Safety I/O input or internal bit B6x:1/8 is low.

This bit will remain high after the condition is cleared until power to the unit is cycled for debugging and troubleshooting.

**B52:3/2** No Weld error is defined as the following:.

The internal bit B6x:5/15 indicates that the weld processor is in Weld mode while the safety I/O input Weld/No Weld or the internal bit B6x:1/6 is low, indicating that the weld processor should be in No Weld mode.

**B52:3/3** Stepper Reset error is defined as the following:

The internal bit B6x:1/10 has gone high, indicating that the SLC processor has asked for a Stepper Reset, and the acknowledge bit B6x:4/5 (All Steppers Are Reset) has NOT gone high.

This bit will remain high after the condition is cleared until power to the unit is cycled for debugging and troubleshooting.

**B52:3/4** Control Not Responding error is defined as follows:

The weld processor has been initiated, but it does not indicate that it has started a sequence through the acknowledge bit B6x:6/2.

This bit will remain high after the condition is cleared until power to the unit is cycled for debugging and troubleshooting.

**B52:3/5** Control Has Reprogrammed EEPROM is defined as the following condition:

The weld processor's MedLAN address or firmware has been (or is being) reprogrammed through a serial upload.

This bit will remain high after the condition is cleared until power to the unit is cycled for debugging and troubleshooting.

**B52:3/6, 7** Spare.

**B52:3/8** Initiation At Power Up error is defined as follows:

One or more Binary Selects and the Initiate Weld bit that would cause the control to initiate a sequence were high during the power-up cycle of the control.

**B52:3/9** Ladder Has Shunt-Tripped Breaker is defined as the following:

The ladder logic has caused a shunt trip of the breaker. (This is NOT a WCU shunt trip request.)

**B52:3/10-14** Spare.

**B52:3/15** Ladder Internal error is activated if one or more weld processor errors are detected.

## B52:4 – B52:9 WCU MESSAGING

The messaging data exchange logic uses these words to show the progress of the information exchange between the SLC and the weld processor.

### B52:4 WCU MESSAGE – SENDING INFO. TO WCU

This word is used to indicate that the ladder logic is sending information to a weld processor.

| Bit | WCU Messaging – Sending to WCU |
|---|---|
| 00 | Spare |
| 01 | Sending Information to WCU #01 |
| 02 | Sending Information to WCU #02 |
| 03 | Sending Information to WCU #03 |
| 04 | Sending Information to WCU #04 |
| 05 | Sending Information to WCU #05 |
| 06 | Sending Information to WCU #06 |
| 07 | Sending Information to WCU #07 |
| 08 | Sending Information to WCU #08 |
| 09 | Sending Information to WCU #09 |
| 10 | Spare |
| 11 | Spare |
| 12 | Spare |
| 13 | Spare |
| 14 | Spare |
| 15 | Spare |

**Note:**

*For further information on how to use these commands for WCU messaging, refer to Chapter 5,* **Advanced Messaging Options.**

## B52:5 WCU MESSAGE–RECEIVING INFO FROM WCU

This word is used to indicate that the ladder logic is receiving information from a weld processor

| Bit | WCU Messaging – Receiving from WCU |
|---|---|
| 00 | Spare |
| 01 | Receiving Information from WCU #01 |
| 02 | Receiving Information from WCU #02 |
| 03 | Receiving Information from WCU #03 |
| 04 | Receiving Information from WCU #04 |
| 05 | Receiving Information from WCU #05 |
| 06 | Receiving Information from WCU #06 |
| 07 | Receiving Information from WCU #07 |
| 08 | Receiving Information from WCU #08 |
| 09 | Receiving Information from WCU #09 |
| 10 | Spare |
| 11 | Spare |
| 12 | Spare |
| 13 | Spare |
| 14 | Spare |
| 15 | Spare |

**Note:**

*For further information on how to use these commands for WCU messaging, refer to Chapter 5,* **Advanced Messaging Options.**

## B52:6 WCU MESSAGE–TRANSFER COMPLETE

This word indicates that the command and data have been sent by the ladder, and that the ladder logic has received the response.

| Bit | WCU Messaging – Transfer Complete |
|---|---|
| 00 | Spare |
| 01 | Transfer Complete WCU #01 |
| 02 | Transfer Complete WCU #02 |
| 03 | Transfer Complete WCU #03 |
| 04 | Transfer Complete WCU #04 |
| 05 | Transfer Complete WCU #05 |
| 06 | Transfer Complete WCU #06 |
| 07 | Transfer Complete WCU #07 |
| 08 | Transfer Complete WCU #08 |
| 09 | Transfer Complete WCU #09 |
| 10 | Spare |
| 11 | Spare |
| 12 | Spare |
| 13 | Spare |
| 14 | Spare |
| 15 | Spare |

**Note:**

*For further information on how to use these commands for WCU messaging, refer to Chapter 5,* **Advanced Messaging Options.**

## B52:7 WCU MESSAGE–WCU #n BUSY

This word indicates that a weld processor is currently processing a command and is not ready to receive a new messaging command.

| Bit | WCU Messaging – Weld Processor Busy |
|---|---|
| 00 | Spare |
| 01 | WCU #01 Busy |
| 02 | WCU #02 Busy |
| 03 | WCU #03 Busy |
| 04 | WCU #04 Busy |
| 05 | WCU #05 Busy |
| 06 | WCU #06 Busy |
| 07 | WCU #07 Busy |
| 08 | WCU #08 Busy |
| 09 | WCU #09 Busy |
| 10 | Spare |
| 11 | Spare |
| 12 | Spare |
| 13 | Spare |
| 14 | Spare |
| 15 | Spare |

**Note:**

*For further information on how to use these commands for WCU messaging, refer to Chapter 5,* **Advanced Messaging Options.**

## B52:8 WCU MESSAGE–RESPONSE VALIDATED WCU #n

This word indicates that the response to the command was received as predicted.

| Bit | WCU Messaging – Valid Response |
|---|---|
| 00 | Spare |
| 01 | Response Validated WCU #01 |
| 02 | Response Validated WCU #02 |
| 03 | Response Validated WCU #03 |
| 04 | Response Validated WCU #04 |
| 05 | Response Validated WCU #05 |
| 06 | Response Validated WCU #06 |
| 07 | Response Validated WCU #07 |
| 08 | Response Validated WCU #08 |
| 09 | Response Validated WCU #09 |
| 10 | Spare |
| 11 | Spare |
| 12 | Spare |
| 13 | Spare |
| 14 | Spare |
| 15 | Spare |

**Note:**

*For further information on how to use these commands for WCU messaging, refer to Chapter 5,* **Advanced Messaging Options.**

## B52:9 WCU MESSAGE–RESPONSE NOT VALID WCU #n

This word indicates that the response the ladder logic received from the WCU was not received properly.

| Bit | WCU Messaging – Non-Valid Response |
|---|---|
| 00 | Spare |
| 01 | Response Not Valid WCU #01 |
| 02 | Response Not Valid WCU #02 |
| 03 | Response Not Valid WCU #03 |
| 04 | Response Not Valid WCU #04 |
| 05 | Response Not Valid WCU #05 |
| 06 | Response Not Valid WCU #06 |
| 07 | Response Not Valid WCU #07 |
| 08 | Response Not Valid WCU #08 |
| 09 | Response Not Valid WCU #09 |
| 10 | Spare |
| 11 | Spare |
| 12 | Spare |
| 13 | Spare |
| 14 | Spare |
| 15 | Spare |

**Note:**

*For further information on how to use these commands for WCU messaging, refer to Chapter 5,* **Advanced Messaging Options.**

## Data File B53 – Safety I/O Bits

### B53:0 Safety I/O Bits

This word contains the Safety I/O status information. These bits are used to control all times, and receive status from all timers. When these bits are used, the corresponding bits in B6x do NOT need to be used.

The integrator will use these bits to pass information from the WTC-supplied overhead logic, to the pre-wired safety I/O by additional logic in ladder file #2.

**Note:**

*When Program File #50 is executed in every scan of the ladder logic, the safety I/O bits are transferred to all the weld processors in the system. Refer to Chapter 3,* **Program File Organization**.

| Bit | Safety I/O Bits | |
|---|---|---|
| 00 | Weld / No Weld | Inputs TO WTC Cards |
| 01 | Control Stop | |
| 02 | System Cooling | |
| 03 | I.C. Aux. Contacts | |
| 04 | Fault Reset | |
| 05 | Stepper Reset | |
| 06 | Ladder Wants Shunt Trip | |
| 07 | Spare | |
| 08 | No Faults | Outputs FROM WTC Cards |
| 09 | I. C. Control | |
| 10 | Shunt Trip | |
| 11 | Alert | |
| 12 | Spare | |
| 13 | Spare | |
| 14 | Spare | |
| 15 | Spare | |

**B53:0/0** Weld / No Weld is defined as the following (*Required if bit B6x:1/6 is not used*):

This bit defines whether the weld processor is in Weld or No Weld mode. With this bit ***active***, the timer is in Weld mode. With this bit ***inactive***, the timer is in No Weld mode.

**B53:0/1** Control Stop is defined as the following (*Required if bit B6x:1/8 is not used*):

This bit is normally high. When it is de-activated, the control will abort the present sequence. It will not initiate another sequence until this bit becomes active again.

If another initiation is attempted before this bit becomes active, a Control Stop fault will be generated and the No Fault output will become de-energized.

**B53:0/2** System Cooling is defined as the following (*Required if bit B6x:3/0 is not used*):

This bit is an input to the weld processor. It signals that the control has reached an over-temperature condition.

If this bit is not active when the processor receives a weld initiate, a System Cooling fault will be generated and the No Fault output de-energized. A weld function must be in the schedule for this fault to be generated.

**B53:0/3** I. C. Aux. Contacts is defined as the following (*Required if an isolation contactor is used*):

This bit is an input to the weld processor. It shows whether the isolation contactor is open or closed. (It is a normally open contact.)

**B53:0/4** Fault Reset is defined as the following:

When this bit goes high, the control resets all present fault / alert conditions.

**Note:** If a fault / alert condition is generated ***after*** this bit goes high but ***before*** it toggles low, the condition will remain.

**B53:0/5** Stepper Reset is defined as the following:

When this bit goes high, the control resets all the steppers to Step 1 and the Weld Count to Step 0. Each weld processor will acknowledge this by setting bit B6x:4/5 high.

**B53:0/6** This bit allows the integrator to shunt-trip the circuit breaker using WTC's ladder logic.

**B53:0/7** Spare.

**B53:0/8** Global No Fault is defined as the following:

When active, this bit signals that the control is functioning normally. If the control shuts down as the result of a fault condition, this bit will be turned off.

This bit is also activated if the SLC ladder logic identifies a fault condition in the handling of I/O by the weld processor. (See "File #80 – I/O Evaluation" on page 3-6.)

**B53:0/9** I. C. Control is defined as the following (*Required if an isolation contactor is used*):

The weld processor controls the isolation contactor: Closing it as needed to weld, and opening it when not welding or during an emergency stop condition.

**Note:**

*Refer to the suggestions on page 4-6 if your application uses multiple isolation contactors.*

**B53:0/10** Shunt Trip is defined as the following (*Required*):

This bit is provided to trip the circuit breaker in case of a shorted SCR, or other catastrophic failure.

**B53:0/11** Global Alert is defined as the following:

Turning this bit OFF signals that the control is functioning normally. Alert conditions are usually less serious than faults. Generally, they warn the operator that maintenance is required.

**B53:0/12-15** Spare.

## B53:x Analog Settings / Channel Selection

This word identifies each analog channel, input type or output type select bit to/from the specified WCU. ***x*** signifies the WCU number, from 01 – 09.

| Bit | Analog Setting / Channel Selection |
|---|---|
| 00 | Analog Channel Select Bit # 1 – From WCU |
| 01 | Analog Channel Select Bit # 2 – From WCU |
| 02 | Analog Output Type Select Bit #1 – To WCU |
| 03 | Analog Output Type Select Bit #2 – To WCU |
| 04 | Analog Output Type Select Bit #4 – To WCU |
| 05 | Analog Input Type Select Bit #1 – To WCU |
| 06 | Analog Input Type Select Bit #2 – To WCU |
| 07 | Analog Input Type Select Bit #4 – To WCU |
| 08 | Unused |
| 09 | Unused |
| 10 | Unused |
| 11 | Unused |
| 12 | Unused |
| 13 | Unused |
| 14 | Unused |
| 15 | Unused |

**B53:x/00, 01** These bits identify which analog channel is available from the WCU. The WCU counts through channels 0 – 3, updating to the next channel every half-cycle. The bits tell the ladder logic which analog channel is available.

| Channel | B53:x/1 | B53:x/0 |
|---|---|---|
| 0 | 0 | 0 |
| 1 | 0 | 1 |
| 2 | 1 | 0 |
| 3 | 1 | 1 |

These bits would be used to enable a rung that copies between an analog card and the analog data area of the overhead logic.

**B53:x/02-04** These bits identify which analog output is currently available from the selected WCU. Refer to “Analog Output Selects” on page 33, for more information

**B53:x/05-07** These bits identify which analog input is currently available to the selected WCU. Refer to “Analog Input Selects” on page 32, for more information

**B53:x/08-15** Unused.

## Analog Input Selects

**B53:x/5-7** Bits 5, 6 and 7 are used as the Input Type Select bits. These bits tell the WCU the maximum and minimum count range, to be compatible with the analog input card being used.

The Analog Input selects determine the type of analog source (current or voltage range) that is installed:

| Reading Analog Inputs | | WTC's Configuration | | | Spectrum's Configuration | | |
|---|---|---|---|---|---|---|---|
| **Analog Range** | **Count Range** | **B53x: 0/07 SEL 4** | **B53x: 0/06 SEL 2** | **B53x: 0/05 SEL 1** | **Bit3** | **Bit2** | **Bit1** |
| –10 V. to +10 V. | –32,768 to +32,764 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0 V. to +10 V. | 0 to +32,764 | 0 | 0 | 1 | 0 | 1 | 1 |
| 0 V. to +5 V. | 0 to +16,384 | 0 | 1 | 0 | 0 | 1 | 0 |
| +1 V. to +5 V. | 3,277 to +16,384 | 0 | 1 | 1 | 0 | 0 | 1 |
| –20 to +20 mA. | –16,384 to +16,384 | 1 | 0 | 0 | — | — | — |
| 0 to +20 mA. | 0 to +16,384 | 0 | 1 | 0 | 1 | 0 | 0 |
| +4 to +20 mA. | 6,242 to +31,208 | 0 | 1 | 1 | 1 | 0 | 1 |
| 0 V. to +10 V. | 0 to 4,095 | 1 | 0 | 1 | | | |
| 0 V. to +5 V. | 0 to 2,047 | 1 | 1 | 0 | | | |
| +1 V. to +5 V. | 409 to 2,047 | 1 | 1 | 1 | | | |
| 0 to +20 mA. | 0 to 2,047 | 1 | 1 | 0 | | | |
| +4 to +20 mA. | 409 to 2,047 | 1 | 1 | 1 | | | |

## Analog Output Selects

**B53:x/2-4** Bits 2, 3 and 4 are used as the Output Type Select bits. These bits tell the WCU the maximum and minimum count range, to be compatible with the analog output card being used.

The Analog Output selects determine the type of analog source (current or voltage range) that is installed:

| Reading Analog Outputs | | WTC's Configuration | | | Spectrum's Configuration | | |
|---|---|---|---|---|---|---|---|
| **Analog Range** | **Count Range** | **B53x: 0/04 SEL 4** | **B53x: 0/03 SEL 2** | **B53x: 0/02 SEL 1** | **Bit3** | **Bit2** | **Bit1** |
| –10 V. to +10 V. | -32,768 to +32,764 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0 V. to +10 V. | 0 to +32,764 | 0 | 0 | 1 | 0 | 1 | 1 |
| 0 V. to +5 V. | 0 to +16,384 | 0 | 1 | 0 | 0 | 1 | 0 |
| 1 V. to 5 V. | 3,277 to +16,384 | 0 | 1 | 1 | 0 | 0 | 1 |
| –20 to +21 mA. | –16,384 to +16,384 | 0 | 0 | 1 | 1 | 1 | 0 |
| 0 to +20 mA. | 0 to +31,208 | 1 | 0 | 0 | 1 | 0 | 0 |
| 4 to +20 mA. | 6,242 to +31,208 | 1 | 0 | 1 | 1 | 0 | 1 |

**Note:**

*All analog inputs and outputs* MUST *be of the same type for a given WCU. The input and output channels, however, may be of different types. (Each WCU can have different analog I/O.)*

## DATA FILE B54 WCU
### – BINARY SELECTS B54:0 All Binary Selects are OFF

| Bit | All Binary Selects are OFF for WCU #n |
|---|---|
| 00 | Spare |
| 01 | All Binary Selects are OFF for WCU #1 |
| 02 | All Binary Selects are OFF for WCU #2 |
| 03 | All Binary Selects are OFF for WCU #3 |
| 04 | All Binary Selects are OFF for WCU #4 |
| 05 | All Binary Selects are OFF for WCU #5 |
| 06 | All Binary Selects are OFF for WCU #6 |
| 07 | All Binary Selects are OFF for WCU 7# |
| 08 | All Binary Selects are OFF for WCU #8 |
| 09 | All Binary Selects are OFF for WCU #9 |
| 10 | All Binary Selects are OFF for WCU #10 |
| 11 | All Binary Selects are OFF for WCU #11 |
| 12 | All Binary Selects are OFF for WCU #12 |
| 13 | Spare |
| 14 | Spare |
| 15 | Spare |

**B54:x/00** Spare.

**B54:x/1-12** These bits are on when no Binary Selects are on for their WCU.

**B54:x/13-15** Spare.

## Data File B55x WCU – Heart Beat Pulse

### B55:1 Heart Beat Pulse

***x*** denotes the number of the weld control (WCU):

| Bit | Heart Beat Pulse for WCU #x |
|---|---|
| 00 | Spare |
| 01 | Heart Beat Pulse for WCU #01 |
| 02 | Heart Beat Pulse for WCU #02 |
| 03 | Heart Beat Pulse for WCU #03 |
| 04 | Heart Beat Pulse for WCU #04 |
| 05 | Heart Beat Pulse for WCU #05 |
| 06 | Heart Beat Pulse for WCU #06 |
| 07 | Heart Beat Pulse for WCU #07 |
| 08 | Heart Beat Pulse for WCU #08 |
| 09 | Heart Beat Pulse for WCU #09 |
| 10 | Heart Beat Pulse for WCU #10 |
| 11 | Heart Beat Pulse for WCU #11 |
| 12 | Heart Beat Pulse for WCU #12 |
| 13 | Spare |
| 14 | Spare |
| 15 | Spare |

**B55:1/00** Spare.

**B55:1/01-12** The bits are on for one scan of the ladder logic when an off-to-on transition of the Heart Beat #1 bit B6x:0/0 is detected.

**B55:1/13-15** Spare.

## B55:2 WCU #n Is Initiated

***x*** denotes the number of the weld control (WCU):

| Bit | WCU #x Is Initiated |
|---|---|
| 00 | Spare |
| 01 | WCU #01 Is Initiated |
| 02 | WCU #02 Is Initiated |
| 03 | WCU #03 Is Initiated |
| 04 | WCU #04 Is Initiated |
| 05 | WCU #05 Is Initiated |
| 06 | WCU #06 Is Initiated |
| 07 | WCU #07 Is Initiated |
| 08 | WCU #08 Is Initiated |
| 09 | WCU #09 Is Initiated |
| 10 | WCU #10 Is Initiated |
| 11 | WCU #11 Is Initiated |
| 12 | WCU #12 Is Initiated |
| 13 | Spare |
| 14 | Spare |
| 15 | Spare |

**B55:2/00** Spare.

**B55:2/01-12** When this bit is high, it signifies that the corresponding WCU is initiated.

**B55:2/13-15** Spare.

# DATA FILE B6X
# WCU-DEPENDENT I/O

**Note:**

**x** *represents the weld processor number. For example, to communicate to Weld Processor #1, then x = 1. Valid processor numbers are* **1** *through* **9**.

## B6x:0 WELD PROCESSOR STATUS WORD

This word is used to pass information to the SLC processor about the status of the weld processor card. The WTC overhead logic uses these bits to determine if the weld processor is functioning.

| Bit | Weld Processor Status Word |
|---|---|
| 00 | I/O Alive (Heart Beat #1) |
| 01 | I/O Stop – Reprogramming Flash ROM |
| 02 | I/O Alive (Heart Beat #2) output |
| 03 | Inverter vs. SCR Weld Control |
| 04 | Spare |
| 05 | Spare |
| 06 | Spare |
| 07 | Spare |
| 08 | Spare |
| 09 | Spare |
| 10 | Message Processing Error |
| 11 | Message Process Busy |
| 12 | Message Output Data Valid |
| 13 | Message Input Data Acknowledge |
| 14 | Messaging Enabled |
| 15 | Spare |

**B6x:0/0** I/O Heart Beat #1 indicates that the weld processor card is alive. The weld processor will change the state of this bit once every 4 line cycles.

**B6x:0/1** I/O Stop – Reprogramming Flash ROM indicates that the weld processor card will not be able to receive or send I/O from the SLC processor because it is writing to its EEPROM.

After the write operation is complete, this bit will again be set low. The following events will cause the control to set this bit high:

- Reprogramming the MedLAN address of a weld processor.
- Reprogramming of the firmware on a weld processor card.

**B6x:0/2** I/O Active (Heart Beat #2) input.

The I/O heart beat #2 indicates that the weld processor is alive and receiving input from the SLC system. The weld processor will set this bit to be the same state as bit B51:0/2. If these bits are not in the same state for 800 msec or 5 scans of the ladder logic (whichever is greater), a Heart Beat fault may be generated.

**B6x:0/3** Inverter (MFDC control).
**= ON** if MFDC program is in the WCU;
**= OFF** if non-MFDC program is in the WCU.

**B6x:0/4-9** Spare.

**B6x:0/10** This bit is on when messaging between the WCU and the SLC is not completely successful.

**B6x:0/11** This bit is on when messaging is in progress.

**B6x:0/12** This bit is on when messaging has successfully provided output data.

**B6x:0/13** This bit is on when messaging has successfully provided input data.

**B6x:0/14** This bit is on when messaging is enabled by the overhead logic.

**B6x:0/15** Spare.

## B6x:1 WELD INPUT WORD #1

This word is used to request that data be uploaded to (or downloaded from) the weld control specified by N90:1.

**Note:**

*The bits 6x:1/6, 8, 10 and 11 can be used for single-processor control. If global control is desired, these bits will be controlled by B53 bits. (See "Data File B53 Safety I/O Bits" on page 2-24 for information on B53:0/0, 1, 4 and 5.)*

| Bit | Weld Input Word #1 |
|---|---|
| 00 | Binary Select #1 |
| 01 | Binary Select #2 |
| 02 | Binary Select #4 |
| 03 | Binary Select #8 |
| 04 | Binary Select #16 |
| 05 | Initiate Weld |
| 06 | Weld / No Weld |
| 07 | Binary Select #32 |
| 08 | Control stop |
| 09 | I. C. Saver Enable |
| 10 | Stepper Reset |
| 11 | Fault Reset |
| 12 | Program Mode Security |
| 13 | Heat Display Security |
| 14 | Tip Dress |
| 15 | Parity / Binary Select #64 |

**B6x:1/0-4** Binary Select is defined as the following:

These Binary Select bits have a weighted value (1, 2, 4, 8 or 16). A sequence to initiate i selected by adding the weighted values of the active bits.

**B6x:1/5** Initiate Weld is defined as the following:

When this bit is active, it tells the control to initiate the sequence selected by the active Binary Select bits.

Set this bit only if the Binary Select bits are valid.

**B6x:1/6** Weld / No Weld is defined as the following:

This bit defines whether the weld processor is in Weld or No Weld mode. With this bit active, the control will be in Weld mode. With this bit inactive, the control will be in No Weld mode.

When the control is in No Weld mode, the weld processor will sequence through the weld schedule as normal, but will not gate the SCR or pull in the isolation contactor.

**B6x:1/7** This bit is a Binary Select bit having a value of 32.

**B6x:1/8** Control Stop is defined as the following:

This bit is normally high. If it goes low during the execution of a weld sequence, the control generates a Control Stop fault, de-activates the No Fault output and will not initiate another sequence until this bit goes high again and the fault has been reset.

**B6x:1/9** I.C. Saver Enable is defined as the following:

When this bit is active, it enables the control's isolation contactor delay timer. The delay timer lets the control hold the isolation contactor closed, to prevent it from dropping out between welds.

If this bit is active at the end of a weld sequence, the isolation contactor will be held in (closed) for the amount of time programmed in the Isolation Contactor Delay setup parameter.

**B6x:1/10** Stepper Reset is defined as the following:

When this bit goes high, the control resets all steppers to Step 1 and the weld count to 0.

**B6x:1/11** Fault Reset is defined as the following:

When this bit goes high, the control resets all fault / alert conditions.

**B6x:1/12** Program Mode Security is defined as the following:

When this bit is high, the control is locked. Only data under the Stepper Status display and the Heat display can be changed.

If using this bit in conjunction with the Heat Display Security bit, only data under the Stepper Status display can be changed.

*Refer to the* **DEP-100S Manual** *for information on the Program Mode display.*

**B6x:13** Heat Display Security is defined as the following:

This bit must be used in conjunction with the Program Mode Security bit. With both bits high, there can be NO changes to ANY programmable data (except under the Stepper Status display.)

*Refer to the* **DEP-100S Manual** *for information on the Heat display.*

**B6x:14** Tip Dress is defined as the following:

When this bit goes active, the control moves to the beginning of the second step in the stepper profile.

B6x:15 Parity is defined as the following:

This bit is only used as a parity input when the Enable Parity input B51:0/8 is set high. This bit is used as Binary Select #64 for non-parity, and when the program supports more than 63 schedules.

If enabling parity, the control recognizes only an ODD number of Binary Select bits. If the sequence to be initiated requires closure of an even number (for example, schedule #2), then this bit must also be active to provide the required odd number of bits.

## B6x:2 WELD INPUT WORD #2

This word is used to pass signals to the weld processor, which controls the welding process.

| Bit | Weld Input Word #2 | |
|---|---|---|
| 00 | Pressure Switch | |
| 01 | Weld Proceed / Weld *Proceed #1* | Alternate ONLY for #T93304 |
| 02 | Weld Proceed / *Weld Proceed #2* | |
| 03 | Spare / *Stepper Group #1 Reset in T93309* | |
| 04 | Spare / *Stepper Group #2 Reset in T93309* | |
| 05 | Aux. Counter Reset | |
| 06 | Retract #1 | |
| 07 | Retract #2 | |
| 08 | I.C. Enable (555 spec.) / *I/O Display Bit #1* | |
| 09 | No Stroke/No Weld (555 spec.) / *I/O Display Bit #2* | |
| 10 | Transformer Over Temp (DIO) / *I/O Display Bit #3* | |
| 11 | I/O Display Bit #4 | |
| 12 | I/O Display Bit #5 | |
| 13 | I/O Display Bit #6 | |
| 14 | I/O Display Bit #7 | |
| 15 | I/O Display Bit #8 | |

**B6x:2/0** Pressure Switch is defined as the following:

If the weld sequence initiated contains Function #68 (WAIT nnn CY. FOR PRESSURE SWITCH), and this bit does not become active in the number of cycles specified, the control aborts the rest of the sequence and will generate a Pressure Switch fault.

The control will also generate a Pressure Switch fault if the weld initiate is removed while the control is waiting in Function #69 (WAIT FOR PRESSURE SWITCH), for this bit to become active.

**B6x:2/1** Weld Proceed / *Weld Proceed #1* is defined as the following:

If the weld sequence initiated contains function #70 (WAIT nn CY. FOR WELD PROCEED)., and this bit does not become active in the number of cycles specified, the control aborts the rest of the sequence and generates a Weld Proceed fault.

The control also generates a Weld Proceed fault if the weld initiate is removed while the control is waiting in function #71 (WAIT FOR WELD PROCEED), for this bit to become active.

*Program T93304 has two Weld Proceed inputs. This bit performs the same function, but for t he specified Weld Proceed input.*

**B6x:2/2-4** Spare.

*Program #T93304 re-assigns these inputs as follows:*

**B6x:2/2** Weld Proceed #2 functions like Weld Proceed #1 above, but requires the presence of the Weld Proceed #2 input. The control will generate the Weld Proceed fault when Weld Proceed #2 is not active, or the initiates are removed while the control is waiting for the input to become active.

**B6x:2/3** Stepper Group #1 Reset (also used in T93309)
**B6x:2/**4 Stepper Group #2 Reset " " " "

These bits tell the control to reset all the steppers assigned to a certain group. When each bit becomes active, all the steppers assigned to that group will be reset.

**B6x:2/5** Aux. Counter Reset is defined as the following.

This input can be used to reset the auxiliary counter that is part of the Stepper Status screen.

This counter increments once for each weld. The regular Stepper Reset input or the Aux. Counter Reset input will reset the counter to zero. If the Aux. Counter exceeds the value set in the stepper program (Aux. Counter Max. Counts = ?????) the Aux. Counter at Max.output (B6x:4/12) is turned ON. Programs T93303.06, T93307.01, and T96307.01 (at least) support the Aux. Counter.

**B6x:2/6** Retract 1 is defined as the following.

This bit controls the state of the Retract Valve 1 output. The action of the valve is based on the status of the Retract Mode setup parameter.

- If this setup parameter is set to **Unlatched**, the state of the Retract Valve 1 output will follow the state of this bit. When this bit is active, the output will be active. When this bit is not active, the output will not be active.
- If this setup parameter is set to **Latched**, the state of the Retract Valve 1 output will change every time this bit is pulsed (turned on and then off).

**B6x:2/7** Retract 2 is defined as the following.

This bit controls the state of the Retract Valve 2 output. The action of the valve is based on the status of the Retract Mode setup parameter.

- If this setup parameter is set to ***Unlatched***, the state of the Retract Valve 1 output will follow the state of this bit. When this bit is active, the output will be active. When this bit is not active, the output will not be active.
- If this setup parameter is set to ***Latched***, the state of the Retract Valve 1 output will change every time this bit is pulsed (turned on and then off).

**B6x:2/8** I.C. Enable (555 spec.) is defined as the following.

- **ON** means that the isolation contactor can be used normally (enabled).
- **OFF** means that the isolation contactor cannot be closed (disabled). This generates an IC Not Enabled fault to be generated after initiating a sequence.

**B6x:2/9** This bit tells the HHT the state of the No Stroke / No Weld input for the 555 specification.

**B6x:2/8-15** The I/O Display bits (8-15) define the state of each input and output provided by the control. The I/O Display screen on the DEP-100S shows a 0 when the input it represents is inactive; or a 1 when the input it represents is active.

I/O Display bits are defined as the following:

| Bit | WCU Input Word #2 | I/O Status Display |
|---|---|---|
| 8 | Programmable #1 | (PRG1) |
| 9 | Programmable #2 | (PRG2) |
| 10 | Programmable #3 / *Transformer Over Temp** | (PRG3) / *(TS2)* * |
| 11 | Programmable #4 | (PRG) |
| 12 | Programmable #5 | (PRG) |
| 13 | Programmable #6 | (PRG) |
| 14 | Programmable #7 | (PRG) |
| 15 | Programmable #8 | (PRG) |

**Note:**

*In a DIO configuration, PRG3 becomes TS2 (Transformer Over Temperature)*

## B6x:3 WELD INPUT WORD #3

This word is used to pass signals to the weld processor, which controls the welding process.

**Note:**

*Bits B6x:3/0, 1 can be used for single-processor control. If global control is desired, these bits will be controlled by B53 bits. (See B53:0/2 and 3.)*

| Bit | Weld Input Word #3 |
|---|---|
| 00 | System Cooling |
| 01 | Isolation Contactor Aux. Contact (N. O.) |
| 02 | Spare |
| 03 | Reserved (Inverter Ready to Weld) |
| 04 | Request Pressure (T93310 only) |
| 05 | Spare |
| 06 | Tip Dress Group #1 |
| 07 | Tip Dress Group #2 |
| 08 | User Input #1 |
| 09 | User Input #2 |
| 10 | User Input #3 |
| 11 | User Input #4 |
| 12 | User Input #5 |
| 13 | User Input #6 |
| 14 | User Input #7 |
| 15 | User Input #8 |

**B6x:3/0** System Cooling is defined as the following:

This bit tells the state of the high-voltage cooling system. If the weld sequence contains Function #79 (WAIT nnn CY. FOR SYSTEM COOLING) and this bit does not become active in the number of cycles specified, the control aborts the remainder of the sequence and will generate a System Cooling fault.

**B6x:3/1** Isolation Contactor is defined as an input tot the weld control, indicating whether the isolation contactor open or closed. This contact is normally open.

(If a normally-closed contact is used in this application, the input signal must be inverted.)

**B6x:3/2** Spare.

**B6x:3/3** Inverter Ready to Weld is defined as the following:

This bit is used when the weld processor is controlling the WTC Mid-Frequency DC (MFDC) Inverter. It tells the processor when the conditions have been met at the inverter to allow welding.

**B6x:3/4** Request Pressure is defined as the following:

The customer's equipment uses this input to request the welder to make available an updated pressure value. The welder finds this value by using an analog input card. When the updated value is ready, the WCU turns on the Read Pressure (B6x:4 / 13) output to inform the customer's equipment. The Request Pressure input and Read Pressure output are only supported by the T93310.01 application program.

**B6x:3/5** Spare.

**B6x:3/6–7** Tip Dress Groups 1 and 2 (used in T93309 only).

**B6x:3/8–15** User inputs. These bits are used by the customer-defined SLC logic.

These bits control the weld processor Functions #65 and #66. These functions tell the control to wait for user inputs to reach a certain state.

These functions are WAIT nnn CY. FOR INP #n TO BE #n (0=OFF, 1=ON) and WAIT FOR INPUT #n TO BE #n (0=OFF, 1=ON). They tell the control to wait until the input reaches the specified state (0 is OFF, and 1 is ON).

Function #65 instructs the control to wait a specified number of cycles. Function #66 is an unconditional wait.

If this bit does not reach the specified state within the number of cycles in Function #65, the control aborts the remainder of the sequence. If the initiate is removed while the control is waiting in one these functions, the control will also abort the sequence.

**CAUTION**

*Note that the weld functions do not use the term* User Input *(even though the I/O definitions do use this term).*DO NOT *confuse the label (Input #n) used in the weld function with an actual input position.*

Refer to the **MedWeld 3005 Technical Reference Manual** for more details on the operation of these functions.

## B6x:4 WELD OUTPUT WORD #1

This word is used to pass signals to the SLC processor that indicate the condition of the weld process.

| Bit | Weld Output Word #1 | Used by Program # |
|---|---|---|
| 00 | I/O active (Ladder Generated) | |
| 01 | Weld in Progress | |
| 02 | No Faults | |
| 03 | Alert | |
| 04 | Weld Mismatch / *End of Weld Schedule (EWS)* / *End of Hold (EOH)* | EWS in T93304 EOH in T93309 |
| 05 | Stepper is Reset | |
| 06 | Weld Complete | |
| 07 | Ready to Weld | |
| 08 | Has Welded Output (HWO) | HWO in T93300 |
| 09 | End of Stepper | |

| | | |
|---|---|---|
| 10 | Stepper Alerted / Approaching Max. | |
| 11 | Tip Dress Request (TPDR) | TPDR in T93303 |
| 12 | Auxiliary Counter at Maximum | |
| 13 | Read Pressure | |
| 14 | Spare | |
| 15 | Spare | |

**B6x: 4/0** Reserved (I/O active (used by RIO and DeviceNet interfaces).

**B6x: 4/1** Weld in Progress is defined as the following:

This bit is activated by the weld control, to indicate that a weld sequence is being executed.

**B6x: 4/2** No Faults is defined as the following:

This bit is active to indicate that the control is functioning normally. If the control shuts down as the result of a fault condition, this bit will be turned off.

**B6x: 4/3** Alert is defined as the following:

This bit is off to indicate that the control is functioning normally.

**B6x: 4/4** Weld Mismatch is defined as the following:

This bit is activated if the control receives a weld initiate while bit **B6x:1/6** is high (Weld mode) and the data entry device is in No Weld mode.

*Program #T93304 re-defines this output as End of Weld Schedule (EWS). Program #T93309 re-defines this output as End of Hold (EOH). This bit is activated when the control activates the functions that turn this output on or off (#54 and #55).*

**B6x: 4/5** Stepper is Reset is defined as the following:

This bit is active to indicate that every active stepper controlled by the weld processor is on its first weld in Step #1.

**B6x: 4/6** Weld Complete is defined as the following:

This bit is activated by the weld control, to indicate that a weld sequence was successfully completed.

**B6x: 4/7** Ready to Weld is defined as the following:

This bit is activate to indicate that the weld control is ready to weld, and will pass current (when the weld processor receives a valid weld initiate) if the following are true:

- The control is in Weld mode,
- No faults exist (or the Initiate On Fault setup parameter is set to ***ALLOW***),
- The Control Stop input is high;
- AC line voltage is present (the WCU is synchronized with the line voltage).

When this bit is active, the RTW (Ready to Weld) LED on the WTC weld processor card will light.

**B6x:4/8** Spare / *Has Welded Output*

*In program #T93301, the Has Welded Output turns on at the end of the weld schedule to inform the processor that the KVAT detected during the weld fell within the limits programmed in the setup parameters or in Function #19.*

*If the weld did not fall within the programmed KVAT limits, this output is not activated at the end of the schedule. (The processor resets this output at the start of the weld schedule.*

**B6x:4/9** End of Stepper is defined as the following:

This bit becomes active if one or more linear steppers reach(es) the end of its profile; or one or more SureWeld stepper(s) reached its (their) programmed limit.

**B6x:4/10** Stepper Approaching Last Step is defined as the following:

For linear steppers, this bit activates to indicate that the control reached the first weld in the last step in the stepper profile.

For SureWeld steppers, this bit activates to indicate that the control reached the programmed value in the Stepper Approaching Max. Weld setup parameter.

**B6x:4/11** Spare / *Tip Dress Request* is defined as the following:

In program #t93303, the control's Tip Dress features use this output to indicate when a tip dress is required. The processor activates this output when the stepper completes the last programmed weld in Step #3.

**B6x:4/12** Aux. Counter at Maximum is defined as follows:

This bit is turned on when the auxiliary counter value equals or exceeds the 'Aux. Cntr At Max.' stepper parameter.

**B6x:4/13** Read Pressure is defined as the following:

The customer's equipment uses the Request Pressure input to request the welder to make available an updated pressure value. The welder finds this value by using an analog input card. When the updated value is ready, the WCU turns on the Read Pressure (B6x:4/13) output to inform the customer's equipment. The Request Pressure input and Read Pressure output are only supported by the T93310-01 application program.

**B6x:4/14-15** Spare.

## B6x:5 WELD OUTPUT WORD #2

This word is used to pass signals to the SLC processor that indicate the condition of the weld process.

| Bit | Weld Output Word #2 |
|---|---|
| 00 | Valve #1 /<br>*Advance Valve #1 in T93302 and T93304)* |
| 01 | Valve #2 /<br>*Advance Valve #2 in T93302 and T93304)* |
| 02 | Valve #3 |
| 03 | Valve #4 |
| 04 | Valve #5 |
| 05 | Valve #6 |
| 06 | Retract / Blocking Valve #1 |
| 07 | Retract / Blocking Valve #2 |
| 08 | Pressure Select Out #1 |
| 09 | Pressure Select Out #2 |
| 10 | Pressure Select Out #3 |
| 11 | Pressure Select Out #4 |
| 12 | Tip Dress Request Group #1 — T93309 |
| 13 | Tip Dress Request Group #2 — T93309 / Spare |
| 14 | Intensify (Air) Valve |
| 15 | No Weld Output |

**B6x: 5/0–5** These bits are activated or de-activated when the control executes Function #54 (TURN ON WELD VALVE #n) or #55 (TURN OFF WELD VALVE #n).

**Note:**

*For air-over-oil operation in program T93302, the function TURN ON ADVANCE VALVE #1 activates valve #1. TURN ON ADVANCE VALVE #2 activates valve #2.*

**B6x: 5/6** Retract / Blocking Valve #1 bit responds to the on / off status of the Retract #1 input.

**B6x: 5/7** Retract / Blocking Valve #2 bit responds to the on / off status of the Retract #2 input.

**B6x: 5/8-11** Pressure Select is defined as the following:

These bits are activated or de-activated when the control executes Function #56 (TURN ON PRESSURE SELECT #n) or #57 (TURN OFF PRESSURE SELECT #n).

**B6x:5/12** Spare / Tip Dress Request Group #1 is defined as follows:

In program T93309 only, this output turns on when a Tip Dress is needed for a stepper in Stepper Group #1.

**B6x:5/13** Spare / Tip Dress Request Group #2.

In program T93309 only, this output turns on when a Tip Dress is needed for a stepper in Stepper Group #2.

**B6x:5/14** Intensify (Air) Valve. Used when an air cylinder is used (rather than air-over-oil). This is used with B6x:5/0, 5/1, 5/6 and 5/7.

**B6x:5/15** When the Weld / No Weld input is opened, it energizes this bit to indicate that the control is in No Weld. If a weld initiate is received while the control is in No Weld mode, the weld sequence will sequence normally, but **NO WELD CURRENT WILL FLOW**.

## B6x:6 WELD OUTPUT WORD #3

This word is used to pass signals to the SLC processor that indicate desired changes in the local cabinet or the welding environment.

| Bit | Weld Output Word #3 | Used by Program # |
|---|---|---|
| 00 | Isolation Contactor Control | |
| 01 | Shunt Trip | |
| 02 | Initiate Acknowledge | |
| 03 | Spare / *End of Stepper Group #1* | T93304, T93309 |
| 04 | Spare / *End of Stepper Group #2* | T93304, T93309 |
| 05 | Spare / *Stepper Alerted Group #1 in T93309* | |
| 06 | Spare / *Stepper Alerted Group #2 in T93309* | |
| 07 | Charging Contactor (Inverter Ready Request) | Programs w/ MFDC |
| 08 | User Output #1 / *TFF Signal Trigger* | (T95100) |
| 09 | User Output #2 | |
| 10 | User Output #3 | |
| 11 | User Output #4 / *TFF Good Weld* | (T95100) |
| 12 | User Output #5 / *TFF Bad Weld* | (T95100) |
| 13 | User Output #6 / *TFF Expulsion* | (T95100) |
| 14 | User Output #7 / *TFF Bad Part Fitup* | (T95100) |
| 15 | User Output #8 / *TFF Operational Fault* | (T95100) |

**B6x:6/0** Isolation Contactor is defined as the following:

This bit is activated or de-activated when the control executes Function #52 (TURN ON ISOLATION CONTACTOR) or Function #53 (TURN OFF ISOLATION CONTACTOR)

**B6x:6/1** Shunt Trip is defined as the following:

This bit is provided to trip the circuit breaker in case of a shorted SCR or other catastrophic failure.

**B6x:6/2** Initiate Acknowledge is defined as the following:

This bit indicates that the initiation of a sequence has occurred and that at least one Binary Select bit is still active.

**B6x:6/3** Spare / *End of Stepper Group #1* (93304, 93309).

**B6x:6/4** Spare / *End of Stepper Group #2* (93304, 93309).

These two outputs are used in programs #T93304 and T93309 to indicate when any stepper assigned to the group (#1 or #2) has reached the last step in the stepper profile.

**B6x:6/5-6** Spare / *Stepper Alerted Group #1—T93309; Stepper Alerted Group #2—T93309.*

**B6x:6/7** Reserved (as Charging Contactor output for use with the WTC MFDC inverter).

**B6x:6/8-15** User Outputs are defined as the following:

These bits are used by the customer-defined SLC Logic.

***Non-TFF programs use the User Outputs 1–8.***

Program T95100 defines bits B6x:6/8–15 as follows:

**B6x:6/8** Functions in this program use this bit to turn the Signal Trigger output on and off.

**B6x:6/9-10** *Unused*

**B6x:6/11** Spare / *TFF Good Weld* is defined as the following:

In program #T95100, this output activates at the end of the weld schedule to indicate that the Thermal Force Feedback system (TFF) detected a good weld. (The weld parameters fell within the programmed range.)

**B6x:6/12** Spare / *TFF Bad Weld* is defined as the following:

In program #T95100, this output activates at the end of the weld schedule to indicate that the Thermal Force Feedback system (TFF) did not detect a good weld. (The weld parameters fell outside of the programmed range.)

**B6x:6/13** Spare / *TFF Expulsion* is defined as the following:

In program #T95100, this output activates at the end of the weld schedule to indicate that the Thermal Force Feedback system (TFF) detected expulsion during the previous weld.

**B6x:6/14** Spare / *TFF Part Fitup* is defined as the following:

In program #T95100, this output activates at the end of the weld schedule to indicate that the Thermal Force Feedback system (TFF) detected a problem with parts fitup during the previous weld.

**B6x:6/15** TFF Operating Fault is defined as the following:

Program T95100 uses this bit to indicate that a TFF weld generated a fault detectable only by TFF monitoring.

**Note:**

*For more information on the Thermal Force Feedback system, refer to the* **Technical Reference Manual** *for program #T95100.*

## B6x:7 ANALOG OUTPUT DATA WORD

B6x:7 holds the analog output data from the WCU. This is copied by the user's ladder logic to an analog output card, controlled by the channel select bits.

## B6x:10 ANALOG INPUT DATA WORD

B6x:10 holds the analog output data for the WCU. This user's ladder logic copies data from an analog output card to this location, controlled by the channel select bits.

## B6x:11 SPARE STATUS WORD

| Bit | Analog Output Data Word |
|---|---|
| 00 | Analog Channel Select Bit #1 |
| 01 | Analog Channel Select Bit #2 |
| 02 | Contactor Select Bit #1 |
| 03 | Contactor Select Bit #2 |
| 04 | Contactor Select Bit #4 |
| 05 | Contactor Select Bit #8 |
| 06 | Spare |
| 07 | Spare |
| 08 | Spare |
| 09 | Spare |
| 10 | Spare |
| 11 | Spare |
| 12 | Spare |
| 13 | Spare |
| 14 | Spare |
| 15 | Spare |

**B6x:11/00** B6x:11 is the analog Channel Select bit #1 (the same as B53:x / 0).

**B6x:11/01** B6x:11 is the analog Channel Select bit #2 (the same as B53:x / 1).

**B6x:11/02-05** Locations 02, 03, 04 and 05 define the Contactor Select Bit #1, #2, #4 and #8, respectively.

The user decodes the Contactor select bits to control separate contactor outputs (1 to 15). These bits are provided by application programs that support multi-contactor operation. Currently these are T93300–17 or greater, and T93302–03 or greater.

**B6x:11/06-15** Spare.

## Data File N90 Messaging Options Registers

**Note:**

*Reserved for VB1 program ONLY. (Used for extended functionality messaging with controls running current software.)*

*For further information on how to use these commands for WCU messaging, refer to Chapter 5,* Advanced Messaging Options.

| Word | Description |
|---|---|
| 00 | Spare |
| 01 | Weld control number |
| 02 | Sequence number |
| 03 | Stepper number |
| 04 | Stepper type |
| 05 | MedLAN address |

**N90:1:** Weld Control Number is defined as the following:

This word is used to control which weld processor the messaging is from.

*(See also "B50:2 WCU MESSAGING REQUEST" on page 2-6, and Chapter 5,* Advanced Messaging Options.*)*

**N90:2:** Sequence Number is defined as the following:

The word is used to control which weld sequence is uploaded to or downloaded from the weld processor.

*(See also "B50:2 WCU MESSAGING REQUEST" on page 2-6, and Chapter 5,* Advanced Messaging Options.*)*

**N90:3** Stepper Number is defined as the following:

This word is used to control which stepper is uploaded to, or downloaded from, the weld processor.

(*See also "Data File B50 User Control Options" on page 2-4 and Chapter 5,* Advanced Messaging Options.)

**N90:4** Stepper Type is defined as the following:

This word is used to control which type of stepper is uploaded to, or downloaded from, the weld processor:

- 1 is defined as the linear stepper profile.
- 3 is defined as the SureWeld stepper profile. (Type 3 is not currently supported.)

**N90:5** MedLAN Address is defined as the following:

This memory location holds the value of the current address used by the WCU's network port after a performing a messaging upload. This location can be used to change the network address by filling it with the desired value and then performing a messaging download. (Note: MedLAN is used for communication between the WCU and a WSS, MedLAP, MedVIEW or similar.)

The MedLAN Address uniquely identifies the WCU's network port for these other products to communicate with. It is a number between 0 and 29, inclusive.

### N90:1 WCU Number

Valid values for WCU number are from **0** to **12**.

### N90:2 Sequence Number

Valid values for sequence number are from **0** to **99**. The user must verify that the WCU program being run will support up to 99 schedules.

### N90:3 Stepper Number

Valid values for the stepper number are from **0** to **99**. The user must verify that the WCU program being run will support up to 99 steppers.

### N90:4 Stepper Type

At present, only stepper Type **1** (linear steppers) is supported.

### N90:5 MedLAN Address

Valid values for the MedLAN address are from **0** to **29**.

## Data File N91 Messaging Weld Data

This file contains the last weld data (uploaded) for the weld processor number contained in data file N90:1.

| Memory Location | | Summary Weld Data Description |
|---|---|---|
| **B6x** | **N91** | |
| B6x:147 | N91:01 | Weld Sample Counter |
| B6x:148 | N91:02 | SPC Group Number |
| B6x:149 | N91:03 | SPC Bin Number |
| B6x:150 | N91:04 | Weld Sequence Number |
| B6x:151 | N91:05 | Transformer Turns Ratio |
| B6x:152 | N91:06 | Maximum Line Voltage |
| B6x:153 | N91:07 | Average Line Voltage |
| B6x:154 | N91:08 | Minimum Line Voltage |
| B6x:155 | N91:09 | Maximum Primary Current |
| B6x:156 | N91:10 | Average Primary Current |
| B6x:157 | N91:11 | Minimum Primary Current |
| B6x:158 | N91:12 | Maximum Power Factor |
| B6x:159 | N91:13 | Average Power Factor |
| B6x:160 | N91:14 | Minimum Power Factor |
| B6x:161 | N91:15 | C-Factor |
| B6x:162 | N91:16 | Average %I Used For Last Weld |
| B6x:163 | N91:17 | Number of Welding Cycles |
| B6x:164 | N91:18 | Stepper Total Weld Count [LSB] |
| B6x:165 | N91:19 | Stepper Total Weld Count [MSB] |
| B6x:166 | N91:20 | Stepper Number |
| B6x:167 | N91:21 | Stepper Step Weld Count |
| B6x:168 | N91:22 | Maximum Power Factor Drop |
| B6x:169 | N91:23 | Average Power Factor After Blanking Cycles |

| Memory Location | | Summary Weld Data Description |
|---|---|---|
| **B6x** | **N91** | |
| B6x:170 | N91:24 | C-Factor |
| B6x:171 | N91:25 | Desired Current (w/ Constant Current) [LSB] |
| B6x:172 | N91:26 | Desired Current (w/ Constant Current) [MSB] |
| B6x:173 | N91:27 | Step Number |
| B6x:174 | N91:28 | Cylinder Delay |
| * | N91:29 | Average Secondary Current [LSB] |
| | N91:30 | Average Secondary Current [MSB] |
| B6x:177 | N91:31 | KVAT |

* Note that secondary current is computed in File #2 and placed here, where it can be easily displayed by Panel View. No bit memory locations are required for these values.

**Note:**

*For further information on how to use these commands for WCU messaging, refer to Chapter 5,* **Advanced Messaging Options.**

*For an explanation of the parameters, refer to the* **MedWeld 3005 Operator's Guide**.

## Data File N93 Messaging Sequence Profile

This file contains the weld sequence number #N90:2 uploaded from (or downloaded to) the weld processor number contained in N90:1. (The maximum number of functions is 25.)

**Note:**

*N93:0 will contain the number of functions that was uploaded, and/or the number of functions to download.*

| Order | Function # | Parameter 1 | Parameter 2 | Parameter 3 |
|---|---|---|---|---|
| 1 | N93:1 | N93:2 | N93:3 | N93:4 |
| 2 | N93:5 | N93:6 | N93:7 | N93:8 |
| 3 | N93:9 | N93:10 | N93:11 | N93:12 |
| 4 | N93:13 | N93:14 | N93:15 | N93:16 |
| 5 | N93:17 | N93:18 | N93:19 | N93:20 |
| 6 | N93:21 | N93:22 | N93:23 | N93:24 |
| 7 | N93:25 | N93:26 | N93:27 | N93:28 |
| 8 | N93:29 | N93:30 | N93:31 | N93:32 |
| 9 | N93:33 | N93:34 | N93:35 | N93:36 |
| 10 | N93:37 | N93:38 | N93:39 | N93:40 |
| 11 | N93:41 | N93:42 | N93:43 | N93:44 |
| 12 | N93:45 | N93:46 | N93:47 | N93:48 |
| 13 | N93:49 | N93:50 | N93:51 | N93:52 |
| 14 | N93:53 | N93:54 | N93:55 | N93:56 |
| 15 | N93:57 | N93:58 | N93:59 | N93:60 |
| 16 | N93:61 | N93:62 | N93:63 | N93:64 |
| 17 | N93:65 | N93:66 | N93:67 | N93:68 |
| 18 | N93:69 | N93:70 | N93:71 | N93:72 |
| 19 | N93:73 | N93:74 | N93:75 | N93:76 |
| 20 | N93:77 | N93:78 | N93:79 | N93:80 |
| 21 | N93:81 | N93:82 | N93:83 | N93:84 |
| 22 | N93:85 | N93:86 | N93:87 | N93:88 |
| 23 | N93:89 | N93:90 | N93:91 | N93:92 |

| Order | Function # | Parameter 1 | Parameter 2 | Parameter 3 |
|---|---|---|---|---|
| 24 | N93:93 | N93:94 | N93:95 | N93:96 |
| 25 | N93:97 | N93:98 | N93:99 | N93:100 |

**Note:**

*For further information on how to use these commands for WCU messaging, refer to Chapter 5,* **Advanced Messaging Options**.

*For explanations of these parameters, refer to the* **MedWeld 3005 Operator's Guide**.

## Data File N94 Messaging Stepper Profile

**Note:**

*For further information on how to use these commands for WCU messaging, refer to Chapter 5,* **Advanced Messaging Options**.

*For explanations of these parameters, refer to the* **MedWeld 3005 Operator's Guide**.

This file contains the last stepper profile (N90:3) uploaded from or downloaded to the weld processor number contained in data file N90:1.

The SureWeld Stepper (Type #3) is not currently supported.

### Linear Stepper (Type #1)

**N94:0:** Stepper Number

**N94:1:** Stepper Type

| Step | % | Amps. | Welds |
|---|---|---|---|
| 1 | N94:2 | N94:3 | N94:4 |
| 2 | N94:5 | N94:6 | N94:7 |
| 3 | N94:8 | N94:9 | N94:10 |
| 4 | N94:11 | N94:12 | N94:13 |
| 5 | N94:14 | N94:15 | N94:16 |

## SureWeld Stepper (Type #3):

| Location | Description |
|---|---|
| N94:0 | Stepper Number |
| N94:1 | Group Number |
| N94:2 | Number of welds without expulsion before current boost |
| N94:3 | Number of welds with expulsion before decreasing current |
| N94:4 | Number of blanking cycles (ignored at start of weld) |
| N94:5 | 1-cycle power factor expulsion limit |
| N94:6 | Positive trend limit |
| N94:7 | Negative trend limit |
| N94:8 | Maximum (–) additional current in %I |
| N94:9 | Maximum (–) additional current in A. |
| N94:10 | Maximum %I |
| N94:11 | Maximum current |
| N94:12 | End of stepper weld count |
| N94:13 | Alert point $I |
| N94:14 | Alert point current |
| N94:15 | Stepper approaching max. weld count |

**Note:**

*The Stepper Type #3 (SureWeld) is not currently supported.*

# Data File N95
# Messaging
# Stepper Data

**Note:**

*For further information on how to use these commands for WCU messaging, refer to Chapter 5,* **Advanced Messaging Options**.

*For explanations of these parameters, refer to the* **MedWeld 3005 Operator's Guide**.

This file contains the last stepper data uploaded from the weld processor number contained in the file N90:1.

*The download of stepper data is not currently supported.*

## Linear Stepper (Type #1)

**N95:0:** Stepper Number
**N95:1:** Stepper Type

**Upload only:**

:1/ 0 Stepper on last step
:1/ 1 End of stepper
:1/ 2 Stepper Enable / Disable
:1/ 4 Last weld:
0 = AVC Firing
1 = AC Firing

**Download only:**

:1/5 Advance to beginning of next step
:1/6 Change total weld count

**Upload only:**

N95:2 %I current boost
N95:3 Amps. current boost [LSB]
N95:4 Amps. current boost [MSB]
N95:5 Step number
N95:6 Step count

**Upload/Download:**

N95:7 Total Weld Count [LSB]
N95:8 Total Weld Count [MSB]

## SureWeld Stepper (Type #3)

**N95:0:** Stepper Number

**Upload only:**

N95:1 Stepper status
:1 / 1 End of stepper
:1 / 2 Trend limit
:1 / 3 Alert
:1 / 4 Last weld:
0 = AVC Firing
1 = AC Firing
N95 / 2 No expulsion count
N95 / 3 Expulsion count
N95 / 6 ax 1-cy pwr factor drop after blanking*100

**Upload/Download:**

N95:7 %I current boost
N95:8 Amp current boost
N95: 9 Total weld count

**Upload only:**

N95:10 Up trend count
N95:11 Down trend count

# Data File N96
# Messaging
# Fault Mask

**Note:**

*For further information on how to use these commands for WCU messaging, refer to Chapter 5,* **Advanced Messaging Options**.

*For explanations of these parameters, refer to the* **MedWeld 3005 Operator's Guide**.

This file contains the last stepper data uploaded from the weld processor number contained in the file N90:1.

*Information in the table below is for program #T93301-00-04. Refer to the Appendix for additional program listings.*

| Location | Fault Type | Fault Name |
|---|---|---|
| B96:0 / 03 | Internal | Hardware//Software Incompatible |
| B96:0 / 02 | Internal | RAM Checksum Error |
| B96:0 / 01 | Internal | ROM Checksum Error |
| B96:0 / 00 | Internal | Shorted Contactor |
| B6x:1 / 12 | Fault | Control In No Weld |
| B6x:1 / 11 | Fault | Isolation Contactor Not Enabled |
| B6x:1 / 10 | Fault | Welder Current Shunting |
| B6x:1 / 09 | Fault | Retract Pilot |
| B6x:1 / 08 | Fault | Pressure Switch |
| B6x:1 / 07 | Fault | Weld Proceed |
| B6x:1 / 06 | Fault | RIO Comm Error/Not in Run Mode |
| B6x:1 / 05 | Fault | SLC Not in Run Mode |
| B6x:1 / 04 | Fault | I/O Update Timeout |

| Location | Fault Type | Fault Name |
|---|---|---|
| B6x:1 / 03 | Fault | I/O System Timeout |
| B6x:1 / 02 | Fault | Weld Interruption |
| B6x:1 / 01 | Fault | Heat Cycle Limit |
| B6x:1 / 00 | Fault | System Cooling |
| B6x:2 / 15 | Fault | Low C-Factor Limit |
| B6x:2 / 14 | Fault | High C-Factor Limit |
| B6x:2 / 13 | Fault | Low Battery |
| B6x:2 / 12 | Fault | No Zero Crossing Sync. |
| B6x:2 / 11 | Fault | Isolation Contactor Error |
| B6x:2 / 10 | Fault | ACC Limit |
| B6x:2 / 09 | Fault | Iso Contactor Off When Needed |
| B6x:2 / 08 | Fault | Reweld Fault |
| B6x:2 / 07 | Fault | Insufficient Line Voltage |
| B6x:2 / 06 | Fault | AVC Limit |
| B6x:2 / 05 | Fault | Power Factor Limit |
| B6x:2 / 04 | Fault | Initial Power Factor Out of Range |
| B6x:2 / 03 | Fault | Slow Cylinder Fault |
| B6x:2 / 02 | Fault | Tips Touching |
| B6x:2 / 01 | Fault | Tips Not Touching |
| B6x:2 / 00 | Fault | SCR Misfire |
| B6x:3 / 15 | Fault | Low Current Limit |
| B6x:3 / 14 | Fault | High Current Limit |
| B6x:3 / 13 | Fault | SureWeld Trend Limit |
| B6x:3 / 12 | Fault | End of Stepper |
| B6x:3 / 11 | Fault | Stepper Approaching Maximum |
| B6x:3 / 10 | Fault | Control Stopped |
| B6x:3 / 09 | Fault | Weld Initiate Not Present |
| B6x:3 / 08 | Fault | Invalid Sequence Selected |

| Location | Fault Type | Fault Name |
|---|---|---|
| B6x:3/07 | Fault | Unused |
| B6x:3/06 | Fault | Unused |
| B6x:3/05 | Fault | Unused |
| B6x:3/04 | Fault | Control In No Weld |
| B6x:3/03 | Alert | Isolation Contactor Not Enabled |
| B6x:3/02 | Alert | Welder Current Shunting |
| B6x:3/01 | Alert | Retract Pilot |
| B6x:3/00 | Alert | Pressure Switch |
| B6x:4/15 | Alert | Weld Proceed |
| B6x:4/14 | Alert | RIO Comm Error/Not in Run Mode |
| B6x:4/13 | Alert | SLC Not in Run Mode |
| B6x:4/12 | Alert | I/O Update Timeout |
| B6x:4/11 | Alert | I/O System Timeout |
| B6x:4/10 | Alert | Weld Interruption |
| B6x:4/09 | Alert | Heat Cycle Limit |
| B6x:4/08 | Alert | System Cooling |
| B6x:4/07 | Alert | Low C-Factor Limit |
| B6x:4/06 | Alert | High C-Factor Limit |
| B6x:4/05 | Alert | Low Battery |
| B6x:4/04 | Alert | No Zero Crossing Sync. |
| B6x:4/03 | Alert | Isolation Contactor Error |
| B6x:4/02 | Alert | ACC Limit |
| B6x:4/01 | Alert | Iso Contactor Off When Needed |
| B6x:5/00 | Alert | Reweld Fault |
| B6x:5/15 | Alert | Insufficient Line Voltage |
| B6x:5/14 | Alert | AVC Limit |
| B6x:5/13 | Alert | Power Factor Limit |

| Location | Fault Type | Fault Name |
|---|---|---|
| B6x:5 / 12 | Alert | Initial Power Factor |
| B6x:5 / 11 | Alert | Slow Cylinder Fault |
| B6x:5 / 10 | Alert | Tips Touching |
| B6x:5 / 09 | Alert | Tips Not Touching |
| B6x:5 / 08 | Alert | SCR Misfire |
| B6x:5 / 07 | Alert | Low Current Limit |
| B6x:5 / 06 | Alert | High Current Limit |
| B6x:5 / 05 | Alert | SureWeld Trend Limit |
| B6x:5 / 04 | Alert | End of Stepper |
| B6x:5 / 03 | Alert | Stepper Approaching Maximum |
| B6x:5 / 02 | Alert | Control Stopped |
| B6x:5 / 01 | Alert | Weld Initiate Not Present |
| B6x:5 / 00 | Alert | Invalid Sequence Selected |

# Welder Part Identification

## N98 File Organization

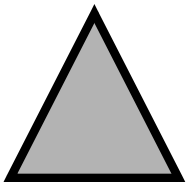
| WCU # | MSW | LSW |
|---|---|---|
| WCU #1 | N98:1 | N98:2 |
| WCU #2 | N98:3 | N98:4 |
| WCU # 3 | N98:5 | N98:6 |
| WCU #4 | N98:7 | N98:8 |
| WCU #5 | N98:9 | N98:10 |
| WCU #6 | N98:11 | N98:12 |
| WCU #7 | N98:13 | N98:14 |
| WCU #8 | N98:15 | N98:16 |
| WCU #9 | N98:17 | N98:18 |

## Data File N98 Part I.D. Transfer

This is used for V158 and V199 with program #T-96305-07 (or later).

| Addresses: | | Formats: | | |
|---|---|---|---|---|
| N91: | B61: | 7/11: | 12/13: | 15: |
| 0 | 147 | Format # | Format # | Format # |
| 1 | 148 | Sample Counter | Sample Counter | Sample Counter |
| 2 | 149 | Group # | Group # | Group # |
| 3 | 150 | Bin # | Bin # | Bin # |
| 4 | 151 | Sequence # | Sequence # | Part I.D. - LSW |
| 5 | 152 | Turns Ratio | Turns Ratio | Part I.D. - MSW |
| 6 | 153 | Max. Line V | Max. DC Bus V | Sequence # |
| 7 | 154 | Ave. Line V | Ave. DC Bus V | Max. Line V |
| 8 | 155 | Min. Line V | Min. DC Bus V | Ave. Line V |
| 9 | 156 | Max. Primary I | Max Primary I | Min. Line V |
| 10 | 157 | Ave. Primary I | Ave. Primary I | Max. Sec. I - LSW |
| 11 | 158 | Min. Primary I | Min. Primary I | Max. Sec. I - MSW |
| 12 | 159 | Max. Power Factor | Empty | Ave. Sec. I - LSW |
| 13 | 160 | Ave. Power Factor | Empty | Ave. Sec. I - MSW |
| 14 | 161 | Min. Power Factor | Empty | Min. Sec. I - LSW |

| | | | | |
|---|---|---|---|---|
| 15 | 162 | C-Factor | C-Factor | Min. Sec. I - MSW |
| 16 | 163 | Ave. %I Fired | Ave %I Fired | Max. Power Factor |
| 17 | 164 | Number of Weld Cycles | Empty | Ave. Power Factor |
| 18 | 165 | Total Weld Count - LSW | Total Weld Count - LSW | Min. Power Factor |
| 19 | 166 | Total Weld Count - MSW | Total Weld Count - MSW | C-Factor |
| 20 | 167 | Stepper Number | Stepper Number | Ave. %I Fired |
| 21 | 168 | Step Weld Count | Step Weld Count | Number of Weld Cycles |
| 22 | 169 | Max. PF Drop (x 100) | Empty | Total Weld Count - LSW |
| 23 | 170 | Ave. PF After Blanking | Empty | Total Weld Count - MSW |
| 24 | 171 | Empty | Empty | Step Weld Count |
| 25 | 172 | I Desired - LSW | I Desired - LSW | Max. PF Drop (x 100) |
| 26 | 173 | I Desired - MSW | I Desired - MSW | Ave. PF After Blanking |
| 27 | 174 | Step Number | Step Number | I Desired - LSW |
| 28 | 175 | Cylinder Delay | Empty | I Desired - MSW |
| 29 | 176 | Ave. Sec. I - LSW | Ave. Sec. I - LSW | Stepper Number |
| 30 | 177 | Ave. Sec. I - MSW | Ave. Sec. I - MSW | Step Number |
| 31 | 178 | KVAT - LSW (format 11) | KVAT - LSW (format 13) | Cylinder Delay |
| 32 | 179 | KVAT - MSW (format 11) | KVAT - MSW (format 13) | Contactor Number |
| 33 | 180 | Empty | Max. Sec. I - LSW | Welder I.D. - LSW |
| 34 | 181 | Empty | Max. Sec. I - MSW | Welder I.D. - MSW |
| 35 | 182 | Empty | Ave. Sec. I - LSW | Turns Ratio |
| 36 | 183 | Empty | Ave. Sec. I - MSW | Empty |
| 37 | 184 | Empty | Min. Sec. I - LSW | Empty |
| 38 | 185 | Empty | Min. Sec. I - MSW | Empty |
| 39 | 186 | Empty | Ave. On Time | Empty |
| 40 | 187 | Empty | High Freq. Cycle Count | Empty |
| Used By: | | T93300.16 | T96300.08 | T93300.17 |
| | | T93301.04 | T96300.09 | T93302.03 |
| | | T93303.06 | T96300.10 | T93302.04 |
| | | T93304.02 | T96307.01 | T93302.05 |
| | | T93304.03 | | |
| | | T93306.04 | | |
| | | T93307.01 | | |
| | | T93308.02 | | |
| | | T93308.03 | | |
| | | T93309.05 | | |



# Program File Organization 3

The ladder logic provided by WTC will occupy program files 2 and 50 – 100. Currently-defined files include

| File | Description |
|---|---|
| 2 | Main Program Loop |
| 50 | WTC Pre-Machine Loop |
| 51 | WTC Post-Machine Loop |
| 52 | First Pass – Memory Initialization Organization |
| 55 | Shunt Trip Loop |
| 61–72 | Heat Beat Evaluation |
| 80 | WCU Signal; error Checking |
| 84 | WCU Watch Dog Trip |
| 87 | Messaging Command File |
| 91–97 | Messaging Transfer File |

## File #2—Main Program Loop

The purpose of the ladder logic in File #2 is to integrate the ladder logic provided by WTC and the customer's ladder logic.

The first line in File #2 is a jump to File #50 (WTC Pre-Machine Ladder Logic Loop) to provide the following functions:

- Set up the SLC processor's memory on the first pass of the ladder logic.
- Move the SLC inputs to the correct binary field, to ease use of the system and to provide flexibility.
- Check all safety conditions and immediately act on any invalid safety condition.

The last statement in File #2 is a jump to File #51 (WTC Post-Machine Ladder Logic Loop) to provide these functions:

- Evaluate operation of the weld processor card's response to applied SLC outputs.
- Re-distribute the binary fields to the correct SLC outputs.

# File #50—WTC Pre-Machine Logic Loop

Ladder logic File #50 serves to transfer information between the input image file and bit files, and to evaluate selected safety concerns and act on them.

Program File #50 provides the following functions:

- Set up the SLC processor's memory on the first pass of the ladder logic. (Jump to File #52.)
- Move the safety I.O bits to all weld processors in the system.
- Move the SLC inputs to the correct binary field, to ease use of the systems and provide flexibility.
  - The Allen-Bradley copy file "COP" ladder-logic instructions are used to transfer information between the I/O image files and the bit files.
  - By default, the WTC weld processor card for WCU #1 is assumed to reside in Slot #1, WCU #2 in Slot #2, etc.; WCU #12 in Slot #12. To ensure that files are transferred correctly, you must modify the "COP" instructions to reassign the slot numbers which represent the actual slot the card resides in.

- To avoid copying errors, it is also necessary to delete the “COP” instruction files for any WTC weld processor not used in your system set-up.

- Check all safety conditions. ***Immediately*** act on any invalid safety condition. These conditions include
  - Requests to shunt trip the circuit breaker (Jump to File #55 for shunt trip).
  - Evaluation of the weld processor’s I/O Heart Beat (Jump to Files #61–66).

## File #51—Post-Machine Logic Loop

Ladder logic File #51 serves to check operation of the system and transfer information between the bit files and output image files:

- Evaluate operation of the weld processor card’s response to supplied SLC outputs (File #80).
- Re-distribute the binary files to the correct SLC outputs:
  - The Allen-Bradley copy file “COP” ladder-logic instructions are used to transfer information between the I/O image files and the bit files.
  - By default, the WTC weld processor card for WCU #1 is assumed to reside in Slot #1, WCU #2 in Slot #2, etc. To ensure that files are transferred correctly, you must modify the “COP” instructions to reassign the slot numbers which represent the actual slot the card resides in.
  - To avoid copying errors, it is also necessary to delete the “COP” instruction files for any WTC weld processor not used in your system set-up.

# File #52—First Pass Routine

The ladder logic in File #52 acts to set up the SLC processor's memory on the First Pass of the ladder logic (as defined by bit S:1/15).

**Note:**

*Refer to Allen-Bradley's programming manuals for further information on bit S:1/15.*

This initialization includes the following areas:

- Initialize the control inputs of both the WTC-provided ladder logic and the weld processors. This includes latching or unlatching as required the bits in data File B50:0, B50:1 B51:0.
- Set the desired SLC Status File options. provided ladder logic and the weld processors. This includes latching, unlatching or moving numbers into the correct bytes. Refer to the following table:

| Status File Address | Value | Allen-Bradley Description |
|---|---|---|
| S:1/8 * | Latched | Fault override at power-up bit |
| S:1/10 * | Latched | Load memory module on error bit |
| S:1/11 * | Latched | Load memory module always bit |
| S:1/12 * | Latched | Load memory module and run bit |
| S:3H | 6 (= 60 ms) | Watchdog scan time byte |
| S:15L | 1 | Node address |

* Note to the user: Change the value of this bit to ***unlatched*** if no memory module is to be used.

- Resetting static error files if no errors have occurred since the last execution of File #52. This allows the errors to be seen after cycling power, to help trouble-shoot the system.

- Initialize the SLC processor's memory to a standard state. This includes resetting all timers and counters used by the WTC ladder logic, general-purpose bits in B55 and the bit files that control the welding process: B52, B61, B62, B63, B64, B65 and B66.

## File B55—Shunt Trip Routine

The ladder logic in File #55 responds to a shunt trip signal created by on of the weld processors or the WTC ladder logic.

The Shunt Trip output is strobed at a 40 % duty cycle of 400 msec ON and 600 msec OFF as long as the shunt trip condition exists.

If an isolation contactor is in the system, the control will attempt to ensure that the High voltage is not leaving the cabinet by dropping the isolation contactor control after a delay of 200 msec. The delay time is used to reduce the possibility of dropping out the Isolation Contactor under load, except as a last resort.

## Files #61–72—Heart Beat Evaluation

The ladder logic in this file checks the I/O heart beat of the corresponding WCU, to indicate that it is operating properly. File #61 checks WCU #1; #62, WCU #2; etc.; #72 checks WCU #12.

The I/O Heart Beat indicates that the weld processor card is alive by changing the state of bit B6x:0/0 once every 4 line cycles. For a 50 Hz line, the period of oscillation is 160 msec. For a 60 Hz line, the period is 133 msec.

If the I/O Heart Beat does not toggle once every 250 msec, a weld processor Heart Beat Error bit (B52:1/x) will be set high. This may indicate a bad weld processor.

# File #80—I/O Evaluation

The ladder logic in File #80 serves to check the proper I/O operation of the following bits:

**(B52:3/8) Initiation At Power-Up Error**

A bit combination that would cause the control to initiate a sequence was high during the control's power-up cycle. To clear the error, remove the initiation bit for NO LESS THAN 500 msec.

This error will also indicate a Fault condition by pulsing the Safety I/O No Fault bit 9 times.

**(B52:3/3) Stepper Reset Error**

The Stepper Reset Bit (B6x:1/10) has gone high to indicate the SLC processor has asked for a Stepper Reset and the acknowledge bit (Stepper Is Reset, B6x:4/5) has not gone high.

The control waits up to 2 sec for the acknowledge bit (B6x:4/5) to become active after it receives the command bit (B6x:1/10).

The Stepper Reset Error Bit remains high after the condition is cleared, until power to the unit is cycled for debugging and tr0ubleshooting.

**(B52:1/1-6) Heart Beat Error**

WTC presently allows up to 12 weld processor cards per welding system. Each card has an I/O Heart Beat which indicates that the card is "alive".

If the I/O Heart Beat (for any particular processor card) does not toggle once every 250 msec, its corresponding Heart Beat Error bit will be set high, indicating a possible problem with the card.

| Bit | Weld Processor |
|---|---|
| 01 | Weld Processor #1 |
| 02 | Weld Processor #2 |
| 03 | Weld Processor #3 |
| 04 | Weld Processor #4 |
| 05 | Weld Processor #5 |
| 06 | Weld Processor #6 |
| 07 | Weld Processor #7 |
| 08 | Weld Processor #8 |
| 09 | Weld Processor #9 |
| 10 | Weld Processor #10 |
| 11 | Weld Processor #11 |
| 12 | Weld Processor #12 |

A Heart Beat error will also indicate a fault, as follows:

1. Pulse the Safety I/O Fault bit once.
2. Wait approximately 7 sec.
3. Pulse the Safety I/O Fault bit 1 to 12 more times (depending on which processor encountered the error).

**(B52:3/1) Control Stop**

The isolation contactor's main contacts are still closed, as seen by I.C. Aux. Contact Safety I/O bit (B53:0/3) while the Control Stop bit is low (B6x:1/8).

This condition must occur for 200 msec before the Control Stop Error bit will go high. It remains high after the condition is cleared, until power to the unit is cycled for troubleshooting.

This error also indicates a fault condition by pulsing the Safety I/O Fault bit 5 times.

**(B52:3/2) No Weld Error**

The No Weld output bit (B6x:5/15) is low, indicating that the weld processor is in Weld mode while the Weld/No Weld bit (B6x:6/1) is also low, indicating that the weld processor should be in No Weld mode.

This condition must occur for 200 msec before the No Weld Error bit goes high. It remains high after the condition is cleared, until power to the unit is cycled for troubleshooting.

**(B52:3/4) Control Not Responding Error**

The weld processor has been initiated, but it does not indicate that it has started a sequence through the Initiate Acknowledge bit (B6x:6/2).

The control waits up to 2 sec for the Initiate Acknowledge bit (B6x:6/2) to become active after the weld initiate has been sent.

This error bit remains high after the condition is cleared until power to the unit is cycled for troubleshooting.

**(B52:3/0) Isolation Contactor Error**

The isolation contactor's main contacts are still closed, as seen by I.C. Status Safety bit (B53:0/3), while none of the weld processor cards are requesting that these contacts be closed.

This condition must occur for 200 msec before the Isolation Contactor Error bit will go high. It remains high after the condition is cleared, until power to the unit is cycled for troubleshooting.

This error will also indicate an Alert condition by pulsing the Safety I/O No Fault bit 4 times.

**(B53:3/15) Internal Ladder Logic Error**

This bit is activated if any of the above errors is detected. This bit is reset during execution of Program File #52 on the first pass of the ladder logic.

# File #84—Loss of Heart Beat

Ladder logic file #84 serves to react on an invalid heart beat as follows:

- Override the WCU and zero (de-activate) the bits in Word B6x:5, that indicate desired changes in the welding environment (refer to Word B6x:5, bits 0–14).
- Zero (de-activate) the bits in Word B6x:1, that indicate desired action from the weld processor and immediate output of these (refer to Word B6x:10, bits 10–15).
- Disable the slot the weld processor(s) reside(s) in.

**Note:**

*By default, the WTC weld processor card for WCU #1 is assumed to reside in Slot #1; WCU #2 in Slot #2; etc. To ensure the correct transfer of files, you must modify the "IOM and status word S11" instructions to reassign the slot numbers used to represent the actual slot the card resides in.*

*To avoid compiling errors, you must also modify the "IOM and status word S11" instruction files for any WTC weld processor not used in your system set-up.*

# File #87—Messaging Command File

Ladder logic file #87 serves to convert the single-bit messaging command (provided by the user logic) into the required serial command (sent by the overhead logic to the weld processor).

**Note:**

*File #87 is used to build commands for all the weld processors present in the system. To conserve logic memory, you can delete the logic used to address the weld processors that are not present in the system.*

# Files #91–99—Messaging Transfer File

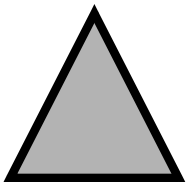
Ladder logic files #91–99 pass the serial command / data (derived in file #87) in 2-word packets to the weld processor. This is accomplished through the use of shift commands.

These files also contain all of the transmission time outs and data checking required to verify that the information was properly transferred.

# SLC Processor File N97

To support the Spectrum analog cards, the SLC processor file N97 will be used as follows:

| Processor | Input Configuration Word | | Output Configuration Word | | Channel Pointer |
|---|---|---|---|---|---|
| | Spectrum | WTC | Spectrum | WTC | |
| WCU #1 | N97:0 | N97:1 | N97:2 | N97:3 | N97:4 |
| WCU #2 | N97:5 | N97:6 | N97:7 | N97:8 | N97:9 |
| WCU #3 | N97:10 | N97:11 | N97:12 | N97:13 | N97:14 |
| WCU #4 | N97:15 | N97:16 | N97:17 | N97:18 | N97:19 |
| WCU #5 | N97:20 | N97:21 | N97:22 | N97:23 | N97:24 |
| WCU #6 | N97:25 | N97:26 | N97:27 | N97:28 | N97:29 |
| WCU #7 | N97:30 | N97:31 | N97:32 | N97:33 | N97:34 |
| WCU #8 | N97:35 | N97:36 | N97:37 | N97:38 | N97:39 |
| WCU #9 | N97:40 | N97:41 | N97:42 | N97:43 | N97:44 |
| WCU #10 | N97:45 | N97:46 | N97:47 | N97:48 | N97:49 |
| WCU #11 | N97:50 | N97:51 | N97:52 | N97:53 | N97:54 |
| WCU #12 | N97:55 | N97:56 | N97:57 | N97:58 | N97:59 |



# Putting It All Together 4

This chapter provides instructions to help the integrator work through integrating the tool and the WTC overhead logic. It also provides hints on using the functionality built into both the WTC 3005 weld processor and the WTC overhead logic.

## Implementation Steps

The procedure to implement the overhead logic entails the following steps:

1. Write the tool logic.
2. Merge the two logic programs.
3. Correct the processor's configuration file.
4. Correct the slot-dependent statements in the overhead logic.
5. Provide the required interlocking logic.
6. Provide initialization options.
7. Provide additional logic for advanced features.

   (This includes such features as displaying welding information on PanelView screens and programming through the use of the Allen-Bradley network tools.)
8. Optimize the ladder logic, if required.

## Explanation of Steps

### Write Tool Logic

The first step is to write the tool logic. Accomplish this by using one of the various SLC-500 programming software versions. This software is available through Allen-Bradley, Rockwell and third-party companies. These packages include A-B's Advanced Programming Software (APS), A, I and RS Logix software, and Rockwell's ICOM-based software.

**Note:**

*This step can be combined with later steps for smaller logic systems.*

### Merge Ladder Files

The second step is to merge the two ladder logic files. Use the tools provided in the SLC-500 programming software.

**Note:**

*This section explains how to use the tools provided with the Allen-Bradley APS software. For comparable tools in other available SLC programming packages, consult your software provider.*

A-B's APS software has two tools you can use for combining the separate logic files. The first is the ***Advanced Editing: Cut and Paste Tools.*** Use this tool to move logic between different ladder files and different programs. It lets you quickly copy the logic files (from the disk provided) to the working copy of the final ladder logic program.

***Cut and Paste Tools*** have these limitations:

- You can cut-and-paste only consecutive rungs within a single file.
- Logic can be copied in this way; but tags and documentation cannot.

The second tool provided with the APS software is the ***Import/ Export*** tool. Use this utility to export the logic and documentation to a text file for editing or combining with other text files. *Import/Export* also allows for re-importing the file into the APS format.

To combine the two documentation files, follow these steps:

1. Use the *Import/Export* utility to export the two documentation files to separate text files. (If APS was installed in the standard directories, you can find *Import/Export* in C:\IPDS\ATTACH\SLC500\ABSIE.EXE.)
2. Combine the files using a text editor.
3. Re-import the resulting single file through the *Import* utility (as in Step 1).
4. The working version of the combined tool logic is the resulting imported file.

## Correct the Processor Configuration File

The third step is to correct the A-B processor's configuration file. To do this, select the **Processor Functions** menu and the **Change Processor** option. The file contains the IDs of all the cards in the SLC rack and the slot where they reside.

Correct this file to have the configuration code **3535** in the slot where the WTC 3005 weld processor resides. During this time, the entire file should be verified as being correct.

## Correct Slot-Dependent Functions

The fourth step is to correct the slot-dependent functions used in the overhead logic. The overhead logic uses these functions to directly access the information in the weld processor card. Find these functions in ladder files #50, #51 and #84.

***Ladder file #50*** contains the move logic statements. These statements move the information provided by the weld processor cards from the SLC INPUT image table to bit fields.

The move logic statements serve to allow inserting the weld processor card into any defined slot without requiring all the reference bits used by the overhead logic to be changed.

These logic rungs begin on rung 7 for weld processor #1, and then incrementally increase until you find weld processor 12 on rung 18. These rungs are edited by the integrator so that weld processors contained in the system have their COP instructions adjusted to the proper slot number. Weld processors not used in the system have their respective rungs deleted.

*Ladder file #51* contains the move logic statements. These statements move the information provided to the Weld Processor cards from bit fields to the SLC OUTPUT image table. These statements also allow the insertion of the Weld Processor card into any defined slot.

These logic rungs begin on rung 2 for weld processor #1. They incrementally increase until you find weld processor 12 on rung 12. The integrator edits these rungs so that weld processors contained in the system have their COP instructions adjusted to the proper slot number, and weld processors not used in the system have their respective rungs deleted.

***Ladder file #84*** contains the loss of I/O handshaking routine. This file is executed when the communication between the WTC Weld Process and the SLC processor is lost.

This file contains two slot-dependent instructions. The first instruction pair is a copy and an *IOM* (immediate output move) instruction. The second instruction is an *OTU* (output unlatch) of the slot available bit.

If you are using a 5/01 CPU, the *IOM* instruction has a different format. To correct the format, edit the instruction and remove the length statement.

**A Hint:**

*Before making this change, be sure to write down the information in these instructions.*

The *COP* and *IOM* instructions are found on the last branches contained on the first rungs found in file #84. These rungs are edited so that weld processors contained in the system have their *COP* and *IOM* instructions adjusted to the proper slot number. Additionally, weld processors not used in the system should have their respective rungs deleted.

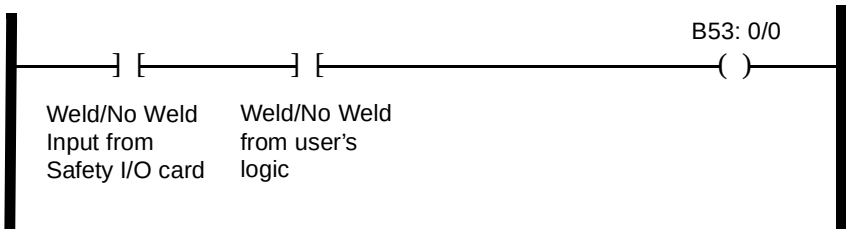
The OTU instructions are used to unlatch the I/O slot enable for the offending weld processor. These bits should be adjusted so that the proper slot is disabled when a weld processor is identified as being bad. (For example, *OTU* S:11 when the processor is in Slot 1*OUT* S:21 when the processor is in Slot 21, etc.)

## Provide Interlocking Logic

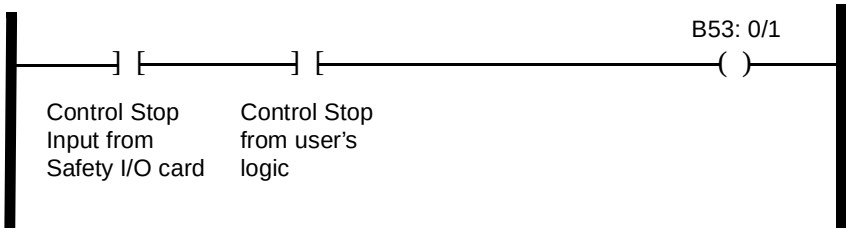
The fifth step is to provide the interlocking logic. This serves to interlock the actual operation of the weld processor with the exterior world. This involves logic between the Safety I/O bit fields and the physical safety I/O cards.

Following is a short list of the required safety interlocking signals and the way of interfacing them in File #2 of the ladder logic.

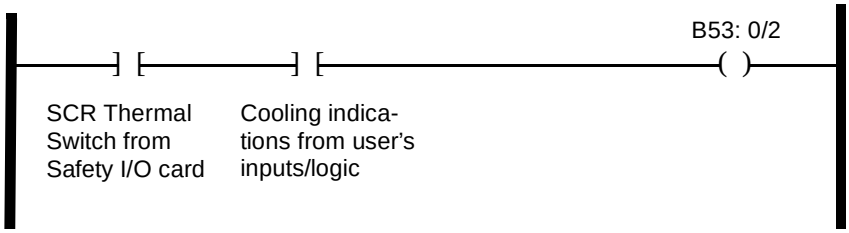
**Bit B53:0/0 —** *Global Weld/No Weld input* (high to pass current):



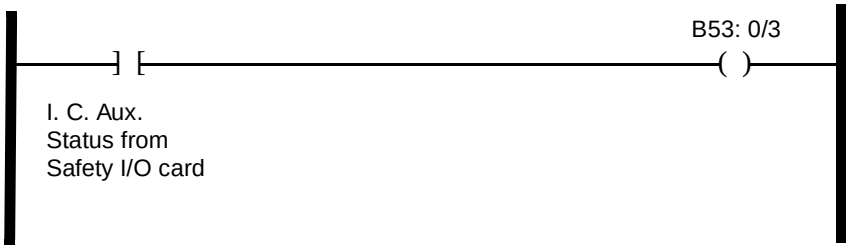

**Bit B53:0/1 —** *Global Control Stop* (high to allow weld processor to sequence):




**Bit B53:0/2 —** *Global System Cooling* (high if cooling is proper):



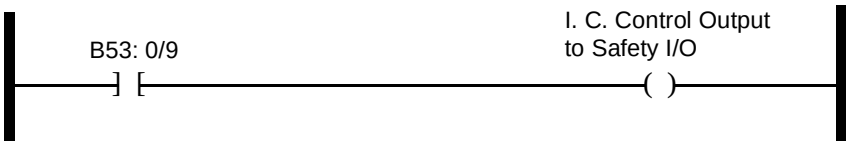
**Bit B53:0/3 —** *Global Isolation Contactor Aux. Contacts,* using normally-open auxiliary contacts. (This can be omitted if an isolation contactor is not used):




**Note:**

*The rung in File 52 that contains address B51/9 for its output instruction must be set to* **latched** *when using an isolation contactor. If no isolation contactor is to be used, set this bit to be* **unlatched**.

**Bit B53:0/9 —** *Global Isolation Contactor Control*. (This can be omitted if an isolation contactor is not used):




**Caution!**

*If multiple isolation contactors are used, exercise caution to properly control the contactors.*

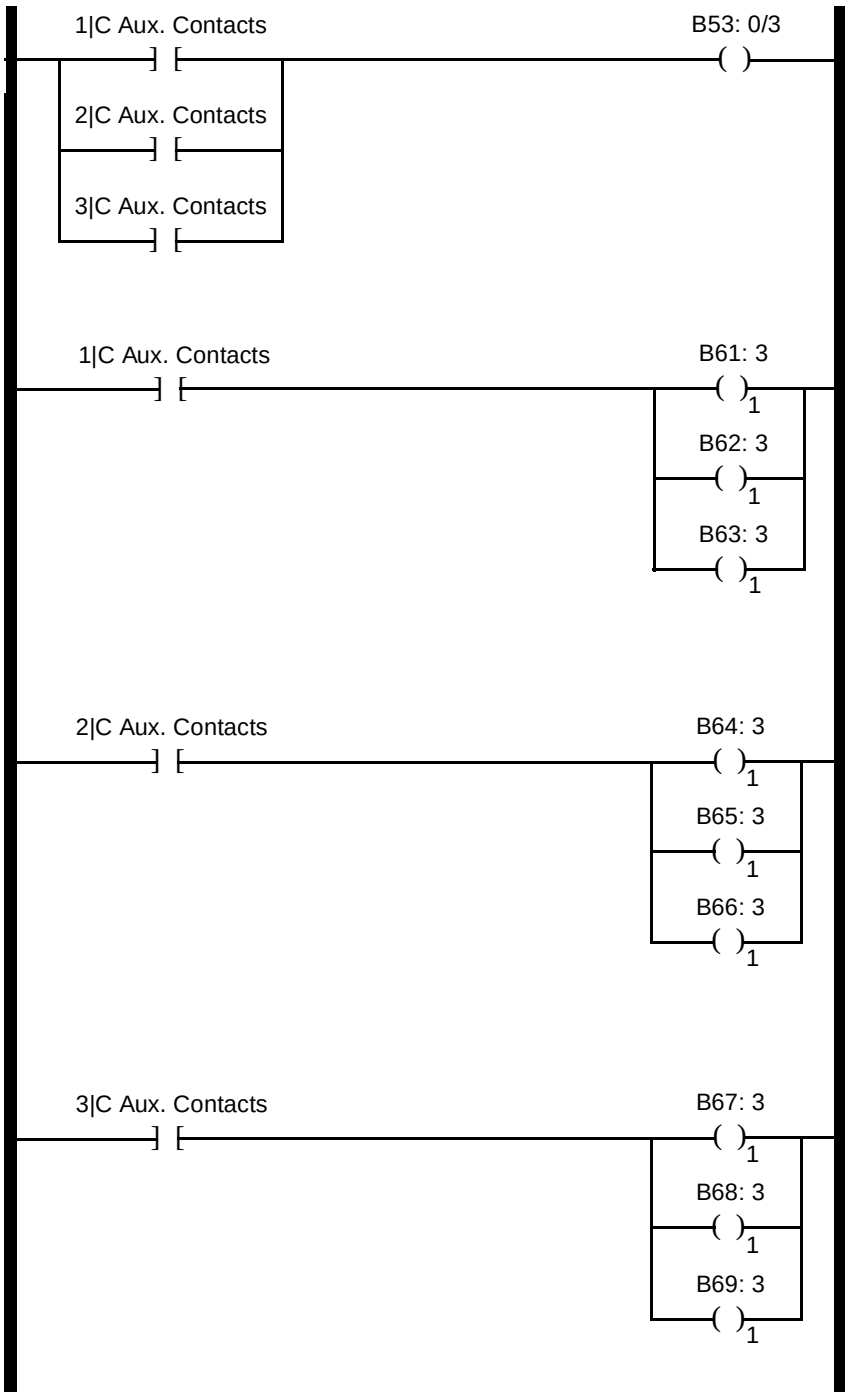
**Example**

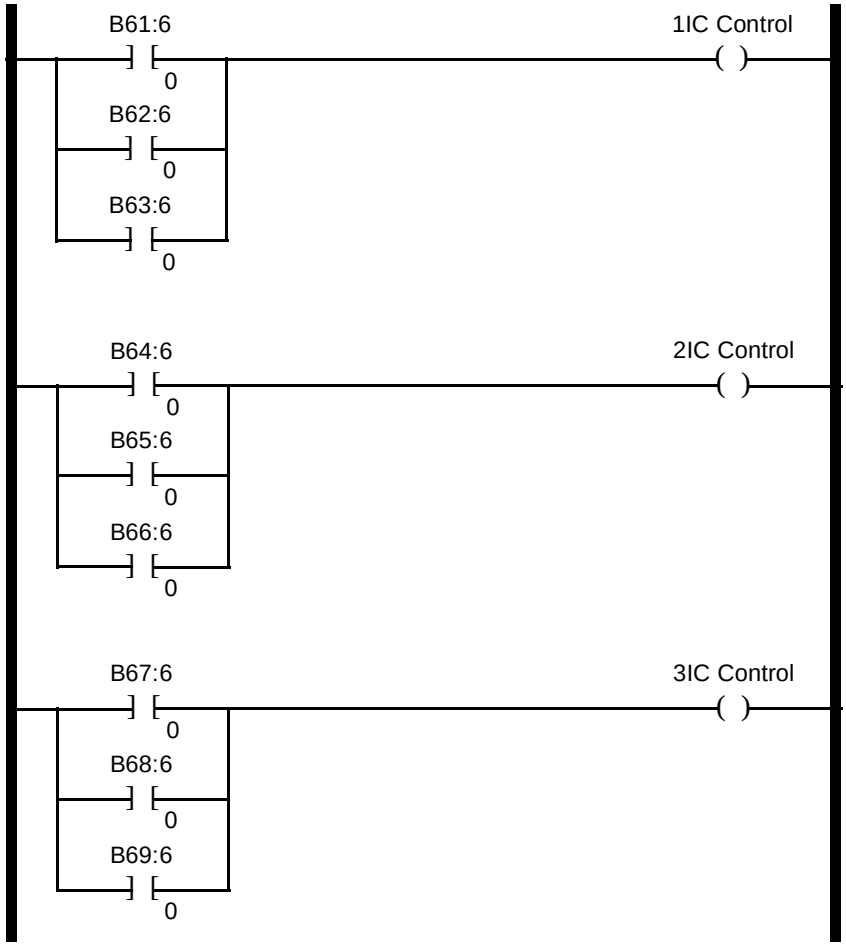
Nine weld processors are in the system. Three isolation contactors are used, such that

- Weld processors 1, 2 and 3 use 1IC
- Weld processors 4, 5 and 6 use 2IC
- Weld processors 7, 8 and 9 use 3IC.

The logic required for this situation appears on the next page.

Logic for multiple isolation contactors:

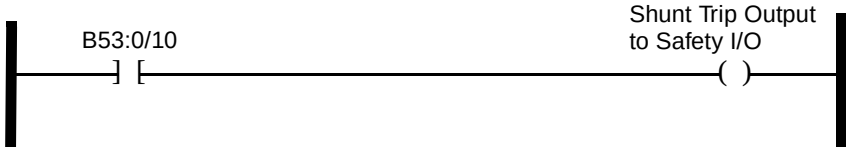





**Bit B53:0/10 —** *Global Shunt Trip*:

**Warning!**

*If not implemented or correctly programmed, the system will* NOT *be able to shunt trip the breaker.*.



## Set the Initialization Options

The sixth step is to set the initialization options for Ladder File #52. These options include the following:

- The weld processor number found in the SLC system
- If an isolation contactor is used
- What memory module and status options will be used and
- Other special options.

The first 4 rungs deal with use of a memory module (by default, it is used). If building the system *without* this module, you must set the beginning rungs to be ***unlatched***, to show the proper status memory state. The initial status data memory must also be set to ***all 0s***.

Next, you must activate the I/O and weld processor card checking. This is done through latching of the B50:0/0 bits for the weld processors in the system that are active. (For example, *OTL* B50:0/1 would activate the support for the first weld processor, *OTL* B50:0/5 for the fifth weld processor, etc.)

These rungs begin on rung 7 of ladder file #52.

Another option lets you enable or disable parity checking. Do this with bit location B51:0/8. To enable checking for parity, set this bit to be ***latched***. To disable, leave this bit ***unlatched***.

The last required start-up option is to indicate whether or not the isolation contactor is used. Do this by latching bit B51:0/9 on rung 19 of file 52. It is ***latched*** if the isolation contactor is used and control by the weld processors. Otherwise, this bit is ***unlatched***.

## Provide for Advanced Features

The seventh step is to implement additional features of the weld processor. This includes stepper reset logic, fault reset logic and other operative interface logic that was not implemented in the first step. This can include a screen for PanelView display of weld data, and programming of weld data parameters.

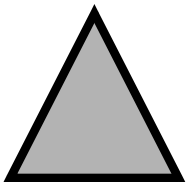
Refer to Chapter 5, *Advanced Messaging Options.*

## Optimize the Ladder Logic

The eighth and final step is to optimize the ladder logic. At this point, you can remove logic for weld processors not used in the system (to reduce the amount of memory required). This also lets the SLC's CPU execute the logic faster.

This step is accomplished in the following files:

- Ladder files in the 60s and 70s function to verify operation of the weld processor cards. Delete the ladder files for non-existing weld processors. Also, remove the jump statements to these files (in file #50).
- Ladder file #80 contains rungs that check the I/O for all processors. Remove the logic for processors not required by the system.
- Ladder file #87 contains the messaging command generation for all weld processors. Delete the block of logic for each processor not used by the system.
- Ladder files in the 90s transfer the messaging information to/from the weld processor. Delete the ladder files for non-existing weld processors. Also, remove the jump statements to these files (in file #51).
- Ladder file #52 contains rungs that reset the data bits for all weld processors. Remove logic to fill data files B6x (***x*** is the weld processor number) with 0 for the weld processors not used in the system.



# Advanced Messaging Options 5

This chapter describes the advanced messaging options that are available. The first section explains what happens "behind the scenes," and how the user will interface with the overhead logic to use these options.

## Behind the Scenes

This section is an aid in your understanding what happens "behind the scenes" in the overhead logic. This describes how to use these features, and what actions to take when the control does not respond as expected.

The first action is placing the information required by the command in the SLC data tables. This includes information such as which weld processor, which command and any other options (such as the sequence number).

The control uses this information to build a serial command. This command is transferred from the SLC to the weld processor (*via* two words of its eight-word output image table). The control responds serially with the data requested (using two words of the SLC input image table). This process allows the transfer to multiple words.

You can monitor the state of this process through memory bits. When the overhead logic starts the command, the user receives a command in process bit. During this time, the user will receive a sending bit, followed by a receiving bit.

The overhead logic now validates the information. If valid, the information will be posted in the expected registers. If the information is not valid, it will not be posted and the Data Invalid bit will be set.

# Summary Weld Data

The first command available is the **Upload Last Weld Data** command. It uploads weld data from the last weld completed by the weld processor.

Activate this command through the use of the bits in data file B53, word 3. In this file, a single bit is used to upload the last weld data from a specific weld processor. (For example, to upload the last weld data from processor #1, bit B50:3/1 would be latched high and the overhead logic would place the information into data file B61. For weld data from processor #2, bit B50:3/2 would be latched high and the overhead logic would place the information into data file B61.)

See the Weld Data Table, below, to determine the location of individual pieces of the weld data.

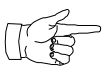
**Note:**

*The command bit is latched high by the user's logic. (See B50:2.) When the overhead logic acknowledges this command and starts pulling this data from the weld processor, the command bit will then be unlatched by the overhead logic and the command in process bit will be set high (see B50:4) until the command is complete. At that point, the in process signal will be set low.*

*If the data received was valid, the data will be moved to the proper memory locations. Otherwise, if the data received was not valid, the error in the last command bit (see B50:4/0) will be set and the memory locations will not be changed.*

When using multiple weld processors, a means has been set up to use a common location to hold this data (to allow the information to be easily displayed). When the weld processor is placed in N90:1, the information will be copied from B6x into N91. (See the Weld Data table on the next page, for actual word assignments.)

**A Hint:**



*These command bits are keyed off the transition of the Initiation Acknowledge signal going low. This uploads the information automatically after each processor executes a weld sequence.*

Then, display this information on a PanelView, collect and send it to other systems or use it to cause special events to occur in the fixture. (This table is an example using program T93301.)

| B6x | N91 | Summary Weld Data Description |
|---|---|---|
| B6x:147 | N91:01 | Weld Sample Counter |
| B6x:148 | N91:02 | SPC Group Number |
| B6x:149 | N91:03 | SPC Bin Number |
| B6x:150 | N91:04 | Weld Sequence Number |
| B6x:151 | N91:05 | Transformer Turns Ratio |
| B6x:152 | N91:06 | Maximum Line Voltage |
| B6x:153 | N91:07 | Average Line Voltage |
| B6x:154 | N91:08 | Minimum Line Voltage |
| B6x:155 | N91:09 | Maximum Primary Current |
| B6x:156 | N91:10 | Average Primary Current |
| B6x:157 | N91:11 | Minimum Primary Current |
| B6x:158 | N91:12 | Maximum Power Factor |
| B6x:159 | N91:13 | Average Power Factor |
| B6x:160 | N91:14 | Minimum Power Factor |
| B6x:161 | N91:15 | C-Factor |
| B6x:162 | N91:16 | Average %I Used For Last Weld |
| B6x:163 | N91:17 | Number of Welding Cycles |
| B6x:164 | N91:18 | Stepper Total Weld Count [LSW] |
| B6x:165 | N91:19 | Stepper Total Weld Count [MSW] |
| B6x:167 | N91:21 | Stepper Step Weld Count |
| B6x:168 | N91:22 | Maximum Power Factor Drop |
| B6x:169 | N91:23 | Average Power Factor After Blanking |
| B6x:170 | N91:24 | C-Factor |
| B6x:171 | N91:25 | Desired Current [LSW] |
| B6x:172 | N91:26 | Desired Current (if using Constant Current) [MSW] |
| B6x:173 | N91:27 | Step Number |
| B6x:174 | N91:28 | Cylinder Delay |

| B6x | N91 | Summary Weld Data Description |
|---|---|---|
| | N91:29 | Average Secondary Current [LSW] |
| | N91:30 | Average Secondary Current [MSW] |
| B6x:177 | N91:31 | KVAT |

# Fault Mask Data

The next command available is **Upload Fault Data**. This command is used to request a bit mask indicating the actual fault that has occurred. The command is activated by bit B50:6/2 and register N90:1.

B50:6/2 indicates the request to upload the fault mask. N90:1 indicates which weld processor fault mask to upload. B50:2/6 is latched high after N90:1 is set to upload the fault mask. The information will be returned in bit file B96. (See section 2.3.11 to determine which bit is associated with each fault.)

**Caution!**

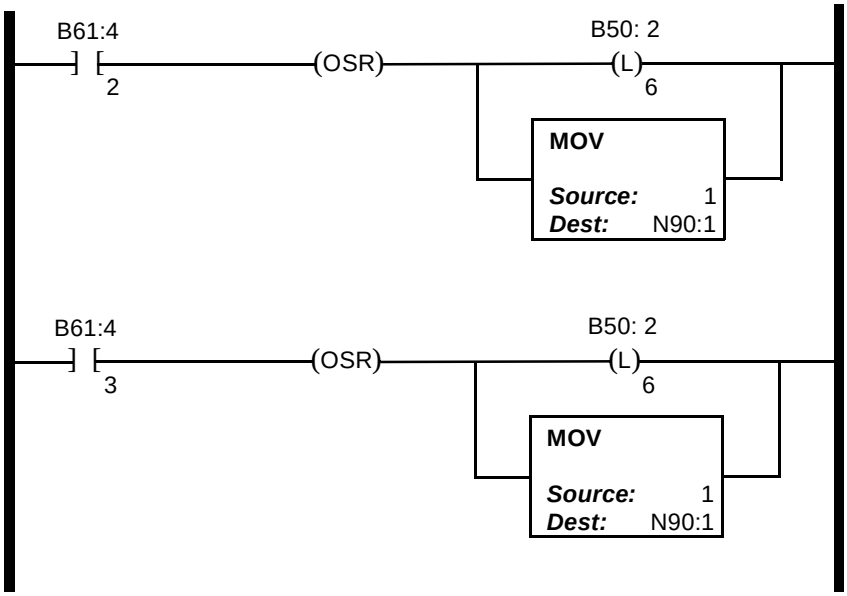
*The fault mask may change with the version of weld processor program. When changing software versions, verify the fault positions.*

**Note:**

*The user logic latches the command bit* **high**. *(See B50:2.) When the overhead logic acknowledges this command and begins pulling this data from the weld processor, the command bit will then be unlatched by the overhead logic, and the command bit in process bit will be set* **high** *(See B50:4). The process bit is set high until the command is complete. At this point, the in process signal will be set* **low**

*If the data received was valid, the data will be moved to the proper memory locations. Otherwise, if the data received was not valid, the error in the last command bit (See BB50:4/0), will be set, and the memory locations will not be changed.*

This command can be keyed off of the transition of the No Fault signal going low and/or the Alert signal going high. Each control automatically uploads the information, if a fault is generated. You can then display this information on a PanelView screen, collected or sent to other systems, or used to cause special events to occur in the fixture.



# Upload/Download Weld Stepper Profile

The next commands available are **Upload Weld Stepper Profile** and **Download Weld Stepper Profile**.

## Upload Weld Stepper Profile

This command is used to request the linear stepper or SureWeld stepper profile be loaded into the SLC data registers from the weld processor. Activate this command by using bit B50:2/1 and registers N90:1, N90:3 and N90:4 as follows:

- Bit B50:2/1 provides the request to upload the weld stepper profile.
- N90:1signifies which weld processor should upload stepper profiles.
- N90:3 indicates the stepper profile desired.
- N90:4 is the type of stepper profile (either linear or SureWeld).

B50:2/1 is latched high after the registers are set to upload the weld stepper profile. The information will be returned to data file N94. Refer to “Data File N94 Messaging Stepper Profile” on page 65 of Chapter 2.

## Download Weld Stepper Profile

This command requests the linear stepper or SureWeld stepper profile be loaded into the SLC data registers from the weld processor. Activate this command by using bit B50:2/2 and registers N90:1, N90:3 and N90:4 as follows:

- Bit B50:2/2 provides the request to download the weld stepper profile.
- N90:1 signifies which weld processor should receive the data.
- N90:3 indicates the stepper profile desired.
- N90:4 is the type of stepper profile (either linear or SureWeld).

B50:2/2 is latched high after the registers are set to download the weld stepper profile. The information will be returned to data file N94. Refer to "Data File N94 Messaging Stepper Profile" on page 65 of Chapter 2 for indication of which word is associated with each step.

**Note:**

*The user logic latches this command bit* **high**. *(See B50:2 on page 2-6.) When the overhead logic acknowledges this command and begins pulling this data from the weld processor, the command bit will then be unlatched by the overhead logic, and the command bit in process bit will be set* **high** *(See B50:4 on page 2-8.) The process bit is set high until the command is complete. At this point, the in process signal will be set* **low**

*If the data received was valid, the data will be moved to the proper memory locations. Otherwise, if the data received was not valid, the error in the last command bit (See BB50:4/0), will be set, and the memory locations will not be changed.*

The values of the new/edited stepper profiles should be verified by the operator interface to assure that they are within proper limits. Refer to the ***MedWeld 3005 Technical Reference Manual***.

# Upload/Download Weld Sequence Data

The next commands available are **Upload Weld Sequence Data**, and **Download Weld Sequence Data**.

## Upload Weld Sequence Data

This command is used to request the weld sequence functions and parameters be loaded into the SLC data registers from the weld processor. Activate this command by using bit B50:2/3 and registers N90:1 and N90:2 as follows:

- Bit B50:2/3 indicates the request to upload the weld sequence data.
- N90:1 signifies which weld processor should upload the sequence data.
- N90:3 indicates the weld sequence number to upload.

B50:2/3 is latched **high** after the registers are set to upload the weld sequence data. The information will be returned to data file N93. Refer to "Data File N93 Messaging Sequence Profile" on page 64 of Chapter 2 for information on which word is associated with each function and parameter.

### Download Weld Sequence Data

This command is used to request the weld sequence functions and parameters be sent from the SLC data registers to the weld processor. Activate this command by using bit B50:2/4 and registers N90:1 and N90:2 as follows:

- Bit B50:2/4 indicates the request to download the weld sequence data.
- N90:1 signifies which weld processor should receive the information from the SLC.
- N90:2 indicates the weld sequence number where the data should be stored.

B50:2/4 is latched **high** after the registers are set to download the weld sequence data. The information will be returned to data file N93. Refer to "Data File N93 Messaging Sequence Profile" on page 64 of Chapter 2 for information on which word is associated with each function and parameter.

**Caution!**

*The fault mask may change with the version of weld processor program. When changing software versions, verify the functions used.*

**Note:**

*The user logic latches the command bit* **high**. *(See B50:2.) When the overhead logic acknowledges this command and begins pulling this data from the weld processor, the command bit will then be unlatched by the overhead logic, and the command bit in process bit will be set* **high** *(See B50:4 on page 2-8). The process bit is set high until the command is complete. At this point, the in process signal will be set* **low**

*If the data received was valid, the data will be moved to the proper memory locations. Otherwise, if the data received was not valid, the error in the last command bit (See BB50:4/0), will be set, and the memory locations will not be changed.*

The function numbers (used on the MedLAN programing network) are hexadecimal values. Exercise caution when displaying these numbers so that they appear as hexadecimal.

To convert these values to decimal, use this calculation:

decimal number = First digit + second digit x 16

The last issue to consider with weld sequence commands are the valid weld sequence parameter values. The values of the functions edited should be verified by the operator interface, to ensure that they are within the proper limits.

For example, in function #20 (WELD nn CYCLES mm %I), a value of 130 % would be invalid; valid values for this parameter are in the range 20 – 99 %I. The range of values for each function are described in the ***MedWeld 3005 Technical Reference Manual***.

## Example Weld Sequence

The following shows an example sequence. For other function numbers and descriptions, refer to the ***MedWeld 3005 Technical Reference Manual***.

| | Function No. | | Description |
|---|---|---|---|
| | **Hex.** | **Dec.** | |
| 1 | 82 | 130 | LINEAR STEPPER # **01** ASSIGNED (0=OFF) |
| 2 | 76 | 118 | SEC. CURRENT LIMITS: HIGH=**00000** LOW=**99990** |
| 3 | 90 | 144 | TRANSFORMER TURNS RATIO **100**:1 |
| 4 | 58 | 88 | TURN ON WELD IN PROGRESS |
| 5 | 52 | 82 | TURN ON ISOLATION CONTACTOR |
| 6 | 1 | 1 | SQUEEZE **30** CYCLES |
| 7 | 3 | 48 | WELD **10** CYC **00050** AMPS |
| 8 | 78 | 120 | PROCESS WELD FAULTS |
| 9 | 3 | 3 | HOLD **05** CYCLES |
| 10 | 50 | 80 | TURN ON WELD COMPLETE |
| 11 | 59 | 89 | TURN OFF WELD IN PROGRESS |
| 12 | 75 | 117 | EXTEND UNTIL NO INITIATE |
| 13 | 51 | 81 | TURN OFF WELD COMPLETE |
| 14 | 53 | 83 | TURN OFF ISOLATION CONTACTOR |

## Sequence Memory Locations and Values

This chart illustrates how the example sequence (above) is stored in memory.

**N93:0 = 14 Functions**

| Function # | Parameter #1 | Parameter #2 | Parameter #3 |
|---|---|---|---|
| N93:1 = 130 | N93:2 = **01** | N93:3 = 0 | N93:4 = 0 |
| N93:5 = 118 | N93:6 = **0000** | N93:7 = **9999** | N93:8 = 0 |
| N93:9 = 144 | N93:10 = **100** | N93:11 = 0 | N93:12 = 0 |
| N93:13 = 88 | N93:14 = 0 | N93:15 = 0 | N93:16 = 0 |
| N93:17 = 82 | N93:18 = 0 | N93:19 = 0 | N93:20 = 0 |
| N93:21 = 1 | N93:22 = **30** | N93:23 = 0 | N93:24 = 0 |
| N93:25 = 48 | N93:26 = **10** | N93:27 = **0005** | N93:28 = 0 |
| N93:29 = 120 | N93:30 = 0 | N93:31 = 0 | N93:32 = 0 |
| N93:33 = 3 | N93:34 = **05** | N93:35 = 0 | N93:36 = 0 |
| N93:37 = 80 | N93:38 = 0 | N93:39 = 0 | N93:40 = 0 |
| N93:41 = 89 | N93:42 = 0 | N93:43 = 0 | N93:44 = 0 |
| N93:45 = 117 | N93:46 = 0 | N93:47 = 0 | N93:48 = 0 |
| N93:49 = 81 | N93:50 = 0 | N93:51 = 0 | N93:52 = 0 |
| N93:53 = 83 | N93:54 = 0 | N93:55 = 0 | N93:56 = 0 |

**Warning!**

*Avoid downloading a value of 0 for any function number. Otherwise, unpredictable operation may result.*